

ABSTRACT  
OF  
The Proceedings of the Thirty-Ninth  
Annual Meeting of the Association  
of Life Insurance Medical  
Directors of America

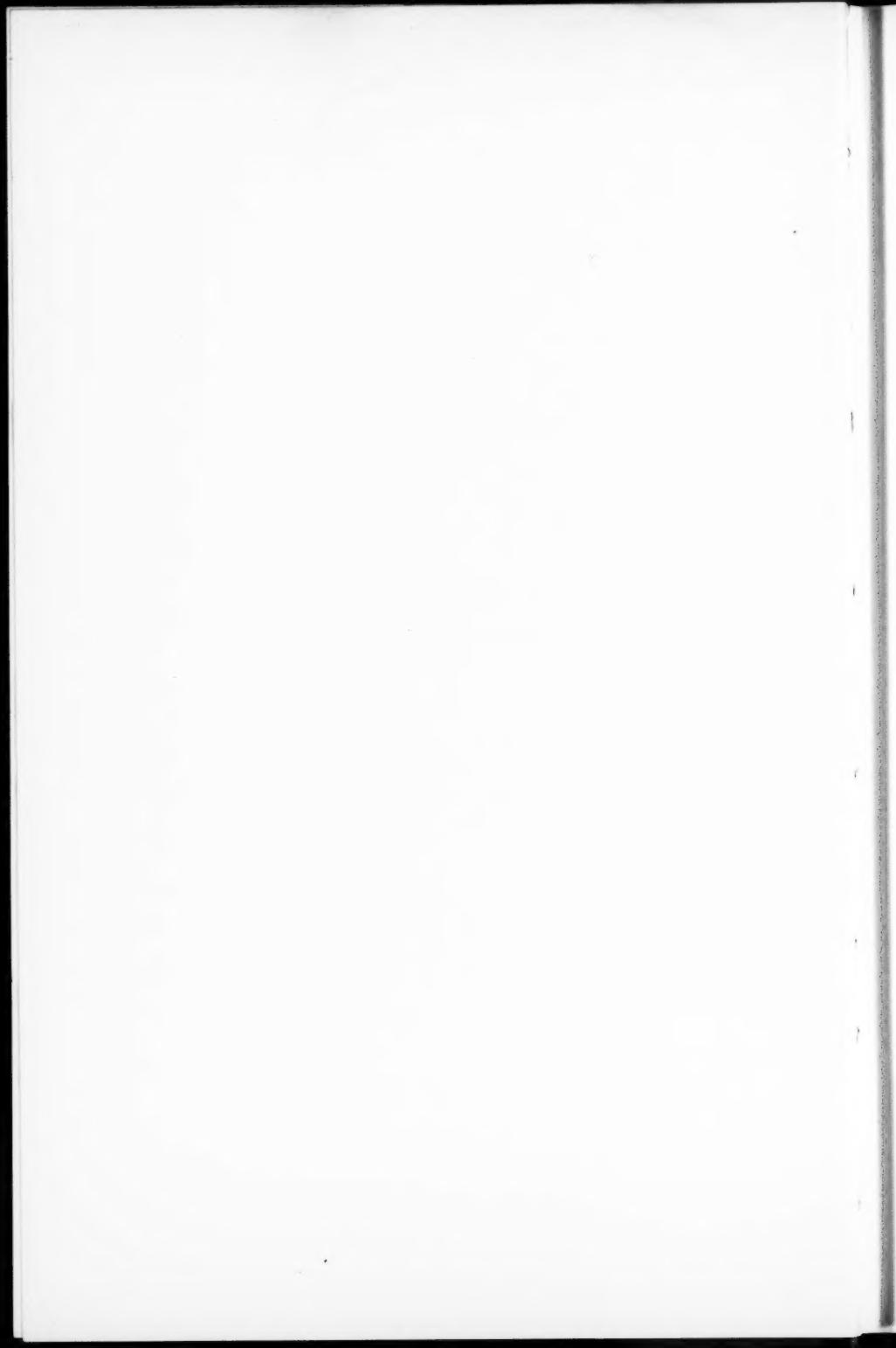
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THE ASSOCIATION OF LIFE INSURANCE  
MEDICAL DIRECTORS OF AMERICA

**Compiled by the Editor of the Proceedings  
by  
Order of the Association**



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An Abstract of the Proceedings

OF THE

Association of  
Life Insurance Medical Directors  
of America

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THIRTY-NINTH ANNUAL MEETING

The Thirty-ninth Annual Meeting of the Association of Life Insurance Medical Directors of America was held at the Hotel Pennsylvania, New York City, on October 25 and 26, 1928. The Association was the guest of the Equitable Life Assurance Society of New York City. President Robert M. Daley was in the chair.

The following members and delegates were present at some time during the sessions: E. H. Allen, G. E. Allen, C. D. Alton, E. M. Armstrong, W. B. Aten, A. E. Awde, H. A. Baker, W. B. Bartlett, J. T. J. Battle, W. W. Beckett, E. W. Beckwith, M. B. Bender, C. C. Birchard, W. F. Blackford, W. M. Bradshaw, C. T. Brown, F. H. Carber, F. A. Causey, F. W. Chapin, L. D. Chapin, C. L. Christiernin, C. P. Clark, Henry Colt, E. A. Colton, H. W. Cook, P. M. Cort, D. B. Cragin, George Cullen, R. M. Daley, E. G. Dewis, H. K. Dillard, E. S. Dillon, H. W. Dingman, O. M. Eakins, C. H. English, W. G. Exton, H. H. Fellows, John Ferguson, Paul Fitzgerald, H. M. Frost, F. I.

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Ganot, W. S. Gardner, Arthur Geiringer, R. T. Gilchrist, R. J. Graves, A. H. Griswold, F. L. Grosvenor, W. F. Hamilton, Frank Harnden, E. M. Henderson, W. L. Hilliard, A. B. Hobbs, J. C. Horan, Ross Huston, W. G. Hutchinson, Lefferts Hutton, C. B. Irwin, W. A. Jaquith, B. Y. Jaudon, F. L. B. Jenney, A. E. Johann, G. E. Kanouse, A. S. Knight, W. P. Lamb, J. M. Livingston, M. T. McCarty, C. W. McCloud, C. B. McCulloch, A. A. MacDonald, F. W. McSorley, R. W. Mann, H. A. Martelle, O. F. Maxon, W. F. Millroy, J. T. Montgomery, R. C. Montgomery, William Muhlberg, C. T. Necker, Herbert Old, M. I. Olsen, J. A. Patton, G. P. Paul, J. S. Phelps, C. B. Piper, J. E. Pollard, J. J. Post, W. A. Reiter, F. P. Righter, A. J. Robinson, T. H. Rockwell, O. M. Rogers, H. B. Rollins, E. K. Root, R. L. Rowley, C. L. Rudasill, S. C. Rumford, E. F. Russell, H. C. Scadding, C. E. Schilling, S. B. Scholz, Jr., H. W. Schroeder, G. H. Shaw, J. T. Sheridan, A. L. Sherrill, D. M. Shewbrooks, R. L. Shields, Dewitt Smith, J. M. Smith, M. K. Smith, Morton Snow, S. C. Stanton, H. F. Starr, J. B. Steele, S. J. Streight, Carl Stutsman, L. G. Sykes, W. E. Thornton, F. L. Truitt, J. P. Turner, C. A. Van Dervoort, Euen Van Kleeck, R. C. Voss, W. R. Ward, W. E. H. Wehner, F. S. Weisse, F. L. Wells, S. S. Werth, C. D. Wheeler, C. F. S. Whitney, A. A. Willander, T. H. Willard, Gordon Wilson, G. E. Woodford, L. S. Ylvisaker.

There were present also Drs. J. L. Andrews, N. R. Blatherwick, L. I. Dublin, Otto Folin, Alexander Lambert, W. H. Ordway, A. R. Rose, and Messrs. Robert Henderson, Arthur Hunter, Frank Jones, Henry Moir, and A. S. Wolf.

Total attendance at all sessions, 153.

On motion the roll call was waived and the members were requested to register their names in the book provided for that purpose.

On motion the reading of the minutes of the thirty-eighth annual meeting of the Association, held on October 27 and 28, 1927, was waived.

The names of the following candidates recommended by the Executive Council for membership in the Association were presented:

- Dr. Norman J. Barker, Connecticut General Life Insurance Company, Hartford, Conn.
- Dr. Edgar W. Beckwith, Equitable Life Assurance Society, New York City.
- Dr. Earl C. Bonnett, Metropolitan Life Insurance Company, New York City.
- Dr. J. Thörnley Bowman, London Life Insurance Company, London, Ont., Canada.
- Dr. Willard B. Carpenter, The Columbus Mutual Life Insurance Company, Columbus, Ohio.
- Dr. Gates Collier, Security Mutual Life Insurance Company, Binghamton, N. Y.
- Dr. Edward S. Dillon, Penn Mutual Life Insurance Company, Philadelphia, Pa.
- Dr. Joseph E. Engelson, Mutual Life Insurance Company of New York, New York City.
- Dr. Haynes H. Fellows, Metropolitan Life Insurance Company, New York City.
- Dr. Ralph T. Gilchrist, Northwestern Mutual Life Insurance Company, Milwaukee, Wis.
- Dr. Henry S. Hutchinson, Crown Life Insurance Company, Toronto, Ont., Canada.
- Dr. Robert C. Montgomery, Manufacturers Life Insurance Company, Toronto, Ont., Canada.

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Dr. Charles T. Necker, Dominion Life Assurance Company, Waterloo, Ont., Canada.  
Dr. Henry B. Rollins, Connecticut Mutual Life Insurance Company, Hartford, Conn.  
Dr. John K. Walker, Penn Mutual Life Insurance Company, Philadelphia, Pa.  
Dr. Stephen S. Werth, Security Life Insurance Company of America, Chicago, Ill.  
Dr. Lauritz S. Ylvisaker, Prudential Insurance Company, Newark, N. J.

On motion of Dr. Willard, seconded by Dr. Jaquith, the Secretary was instructed to cast a ballot in favor of the election of each of these candidates.

The Secretary announced the ballot so cast, and the candidates were declared elected to membership in the Association. The President appointed Drs. Jaquith and Eakins a committee to introduce the newly elected members to the Association. Nine of these members were present and they were escorted into the room by the committee, as follows: Drs. Beckwith, Dillon, Fellows, Gilchrist, Montgomery, Necker, Rollins, Werth and Ylvisaker.

Dr. Daley—We welcome these new members to our Association.

The Secretary reported that Dr. Thomas F. McMahon, formerly Medical Referee of the Manufacturers Life Insurance Company of Toronto, Canada, had been recommended by the Executive Council for Emeritus Membership. On motion duly seconded and carried, Dr. McMahon was admitted to Emeritus Membership.

It is announced that the following persons were present at the meeting as delegates from the American Life Convention:

## Delegates from the American Life Convention 5

Dr. G. T. Brown, Gem City Life Insurance Company, Dayton, Ohio.

Dr. B. F. Byrd, National Life and Accident Insurance Company, Nashville, Tenn.

Dr. E. E. Clovis, Conservative Life Insurance Company, Wheeling, W. Va.

Dr. C. R. Dudley, Continental Life Insurance Company, St. Louis, Mo.

Dr. M. M. Lairy, LaFayette Life Insurance Company, LaFayette, Ind.

Dr. J. B. Neal, Abraham Lincoln Life Insurance Company, Springfield, Ill.

Dr. G. H. Reed, San Jacinto Life Insurance Company, Beaumont, Texas.

Dr. Daley—We welcome you to our meeting.

The Secretary read the minutes of the meetings of the Executive Council of May 23, 1928, and October 24, 1928. On motion these minutes were adopted as read.

Dr. Daley—We have to announce with regret the death of two members of this Association during the past year:

Dr. Albert W. Billing, Assistant Medical Director, Equitable Life Assurance Society of the United States, New York City.

Dr. James B. Eagleson, Medical Director, Northern Life Insurance Company, Seattle, Wash.

Suitable memorials have been prepared and they will be spread on the minutes of this meeting.

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ALBERT W. BILLING, M. D.

Dr. Albert W. Billing died suddenly at his home on Wednesday, December 21, 1927, of chronic myocarditis. He was born in New York City, December 3, 1858.

Dr. Billing was a graduate of the Bellevue Hospital Medical College. He practiced medicine from 1888 to 1900, when he became associated with the Equitable Life Assurance Society as Chief Medical Examiner for Brooklyn.

In 1904 he was appointed a Medical Director for Great Britain, returning home in 1907, when he was appointed Medical Director at Pittsburgh. In 1909 he was transferred to the Home Office and in 1911 was appointed an Assistant Medical Director, in which capacity he continued to serve the Society until his death. He is survived by his wife and two sons.

Dr. Billing was a faithful officer, a sincere friend, and a loyal business associate, whose memory will always be held in affectionate remembrance by all his friends and co-workers in the Society.

JAMES BEATY EAGLESON, M. D.

Dr. James Beaty Eagleson, Medical Director and Trustee of The Northern Life Insurance Company, died at his home in Seattle, January 26, 1928.

Dr. Eagleson was regent and joint founder of The American College of Surgeons; Major in the Medical Reserve Corps; Commander of Base Hospital, No. 50, emerging from the World War with the rank of Colonel; Founder of The Eagleson Clinic; Bank Director; Member of College, University, and Arctic Clubs, Seattle Press Club, Inglewood Golf Club, Amer-

## Report of Nominating Committee 7

ican Medical Association, Association of Military Surgeons of the U. S., American Society for the Advancement of Science, American Academy of Political and Social Science, The Western Surgical and Gynecological Society, The Western Surgical Society, The Pacific Coast Surgical Society, The American Legion, The Veterans of Foreign Wars of the U. S., The "40 and 8" and the Reserve Officers Association. He was also a member of the Municipal League, and Seattle Chamber of Commerce, serving as trustee of the latter organization and chairman of its military affairs committee.

Active in the religious life of the community, Dr. Eagleson was an officer in the Westminster Presbyterian Church, Vice President and Trustee of the Seattle Y. M. C. A. and a member of The Board of Managers of the University Y. M. C. A.

Above all the noted surgeon was a true friend and a real brother. He was a tower of strength in the growth and development of The Great Northwest and of The Northern Life Insurance Company.

His passing brings the deepest sorrow to all who knew him.

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Dr. Daley—The next order of business is the nomination of Officers and Members of the Executive Council. We will have the report of the Nominating Committee.

The Nominating Committee presented the following report:

"The Nominating Committee of the Association of Life Insurance Medical Directors begs leave to report

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that at a meeting regularly held on October 24, 1928, the following nominations were suggested:

For President—Dr. J. Allen Patton.  
For First Vice President—Dr. William Muhlberg.  
For Second Vice President—Dr. Robert L. Rowley.  
For Secretary—Dr. Chester T. Brown.  
For Treasurer—Dr. Charles L. Christiernin.  
For Editor of the Proceedings—Dr. Albert O. Jimenis.

For Members of the Executive Council—Dr. George A. Van Wagenen, Dr. Edwin W. Dwight, Dr. Morton Snow, Dr. Eugene F. Russell, Dr. Ross Huston.

All of which is respectfully submitted.

ROBERT M. DALEY,  
CHESTER T. BROWN,  
WILLIAM R. WARD,  
CHESTER F. S. WHITNEY,  
THOMAS H. WILLIARD, Chairman."

Dr. Daley—The chair asks for other nominations. If anyone desires to place the name of any other member of this Association before us, they now have the privilege of doing so. If you have no names to present, it will be in order to move that the nominations be closed.

No further nominations being presented, it was moved, seconded and carried that the nominations be closed, and that the Secretary be instructed to cast a ballot for the Officers and Members of the Executive Council placed in nomination by the Nominating Committee.

The Treasurer, Dr. C. L. Christiernin, read his report. The Auditing Committee, Dr. Huston and Dr. Russell, reported that the Committee had audited the

Treasurer's report and found it to be correct. On motion by Dr. Jaquith, seconded by Dr. Willard, it was ordered that the report be accepted and placed on file.

Dr. Rogers, Chairman of the Special Committee in charge of the M. I. B., presented the report of that Committee, which was accepted with thanks and ordered placed on file.

Dr. Willard, Chairman of the Committee on Public Health, reported that nothing had occurred during the past year to require the action of the Committee; but he recommended that the Committee be continued.

The Association voted to continue the Committee.

Dr. Patton, Chairman of the Committee on Correlating Practices of Reporting Urinary Impairments, desired to defer any comments until after the reading of Dr. Exton's paper.

Doctor Daly—Gentlemen: Mr. Frank Jones, Vice President of the Equitable Life, wishes to welcome you as its guest. Mr. Jones. (Applause.)

Mr. Frank L. Jones—Dr. Daley and Gentlemen: I have always been interested in conventions, having been a school teacher in my early days, with a desire to meet other teachers at local and state conventions and having been also in life insurance for many years where conventions of agents, managers and officers are the rule. The general principle of getting together, I assume, is the principle of co-operation.

It is an interesting thing to me to see the revelation of human character in meetings of this kind, revealing, as it seems to me it does, two important principles: One, the quality of desiring to impart what one has in ideas for the benefit of other people, and

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the other is the hunger we all have to get all information which other people have so that we may add to our own storehouse of knowledge and methods. Society couldn't lay down two better principles than those of imparting ideas to others and desiring the ideas of others. I suppose it is akin to the old doctrine of giving and receiving, which in these later days has become a single doctrine and not two different doctrines. Giving and receiving are simply parts of the same process. I do not care to enter into a long discussion of this subject because it does get into a kind of philosophical consideration, but certainly it is important to recognize the spirit of giving and receiving as a single transaction in conventions of this type.

The Equitable Life welcomes you here. It wants to do everything it can for your comfort and convenience. I am sure that Dr. Daley, who is from our Home Office and your present Chairman, will see to it that not only are you serviced by the Equitable but that you are made comfortable in the more practical matters of room and food. We hope you will step across the street; in fact, it is rather a dangerous procedure to cross a street in New York, and, therefore, we give you assurance that you are really under our very roof at this moment though you are in the Pennsylvania Hotel. The fact is, we have a tunnel running between the two buildings and you do not have to go out of doors to get into our building. I have been here some weeks and I have not yet been one square away from the Home Office on the surface. However, I have been underneath the ground, burrowing around, which as my friend Dr. McCulloch of the State Life of Indiana would know, is quite a departure from

wandering among the corn fields of the Hoosier State where I have been living up to date.

In any event, we are so near at hand you don't have to get out from under a roof in order to come over to see us at the Equitable and to observe how the Equitable carries on its medical department. May I say also, you will have just as warm a welcome in the Agency Department.

Thank you.

## RELATIONSHIPS OF MEDICAL DIRECTORS

ROBERT M. DALEY, M. D.

*Associate Medical Director, Equitable Life Assurance Society of the United States.*

In preparing this program, I have endeavored to bring out the most important relationships of the Medical Department in its every-day work, and the problems that it is called on to solve with the hope that in its discussion such relationships may be improved to the benefit of all concerned.

Improved relationships generally solve problems.

The institution of life insurance is one of the greatest agencies for promoting the welfare of humanity ever devised. It is a foundation of social progress. It is indemnity for economic loss.

The object of a life insurance company is to sell insurance; to conserve the assets of its sales in a manner that will best serve the interests of the policy-holders, and when their contracts mature, it is the responsibility of the company promptly and faithfully to carry out its agreement.

The Medical Department is one of the most important parts of the company. Its obligation is to help carry on the object for which the company was organized and this can best be done by establishing and promoting a hearty co-operation based on confidence and frankness with the various departments with which it comes in contact.

Its relationships are with the following:

1. The Agency Force.
2. The Applicant.
3. The Medical Examiner.
4. The Actuary.
5. The Underwriting Department and its Executive Head.
6. The Association of Life Insurance Medical Directors.
7. The Best Interests of Life Insurance in General.

#### THE AGENCY FORCE

In order to maintain a proper relationship, it is necessary for us to establish a basis of *good faith*. The quality of honesty is present to the same degree in nearly every occupation. In my experience it is higher in the Agency force than one would expect to find it, considering the temptations, and much higher than in most other occupations. The agent depends upon the acceptance of the business he presents for a living. His viewpoint is that of a layman with a financial interest in the insurability of a person, and it is bound to be different from that of the Medical Director who is responsible for selection and must use good faith with strict honesty in this relationship. The average agent appreciates the fact that a bad risk offered by him to the company is apt to affect his reputation for selection.

The Medical Department is related to the sales part of the company, and should co-operate with the

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salesmen as far as conservation will permit. All of us know of much good business that is lost by the indifferent and careless work of the examiners for whom we are responsible, and for this reason we should search all the more diligently for further medical facts and underwriting reasons that will permit us to accept a risk, the presentation of which has been such as to prohibit its acceptance. The Agency Department should be so educated that it will present information which is often available to the agent, or can be obtained by him toward the proper presentation of his case.

The Agent should be taught that he has the co-operation of the Medical Department; that the latter is anxious to do all that it can to effect the insurance if it can be done safely. The obtaining of further information, a frank discussion of the case and re-examinations should be freely done. The great majority of the agents do not want to place a bad risk on the company's books, but frequently they do not look upon impairments in the same light as the Medical Department. It sometimes takes a considerable degree of patience to bring them to a point where they feel that the right action has been taken toward all concerned. The attitude of the Medical Director should be that of an impartial judge. It should never become a defensive one. When the Agency force is satisfied that the Medical Department is fair, anxious to co-operate and is appreciative of the agent's interest, the problems of the Medical Department will be lessened by such a relationship, and the Medical Department will have fulfilled its duty towards the sales organization of the company.

## THE APPLICANT OR PROSPECTIVE POLICYHOLDER

Let us now turn our attention to the applicant, since it is on his act as a purchaser that the company depends for existence. He is a customer and must be treated with courtesy. Fortunately, for the Medical Department and good underwriting, the insurance companies seek the prospect much more actively and persistently than the converse, so in the great majority of cases we may feel that there is no intent to conceal material facts on the part of the prospect. He is rarely an applicant on his own initiative. Let us bear this in mind, and realize that his first real contact with the company in which he is investing his money is with the examining physician.

Not infrequently it happens that an applicant dreads the examination so much that he puts off purchasing insurance for fear the physical examination will show some grave physical defect.

A doctor of pleasant, neat appearance, who asks every question clearly, going back on the medical history at a different angle to help the memory; a short, business-like examination blank; a thorough, quick, and skillful examination; a proper description by him of any points brought out in the history or the physical examination is a great help to the consummation of a sale. Many sales have been upset by a flippant remark, or an impatient attitude on the part of the examining physician, as well also as a careless physical examination, a slovenly written report, and an unmailed examination. An applicant feels better when he has passed an examination that he knows was thorough. His attitude toward the doctor, the agent, and the company is kindlier, and the policy is a certificate

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of good health. The Medical Department has fulfilled its duty toward the sale of that individual policy.

### THE EXAMINER

The methods of selecting an examiner have been presented and discussed at previous meetings. The suggestion that the physicians throughout the country be classified as to ability and character for life insurance purposes, and that this classified listing should be kept up to date and available for the Medical Departments of all Life Insurance Companies has been presented to the Executive Committee. Such action would save time, expense, conserve and expedite business; but, unfortunately, the plan presents some objections which have prevented the recommendation by the Committee to the Association. Likewise, the standardization of the education of examiners in insurance medicine is desirable. Perhaps a start in this direction might lead to the removal of the objections to classification just mentioned. We all know of the tremendous loss incurred in collecting data pertaining to the insurability of an applicant. The greatest part of this is done by the examiner who fills out the medical examination blank, according to the interrogations there set down. Unfortunately, that is all that many examiners feel they are called upon to do, and they omit much pertinent information because there is no specific interrogation. At times one feels after reviewing an examiner's report that an experienced trained nurse or a clever hospital orderly, could have made it out just as well, if not better.

I believe that much of this indifferent work of

the medical examiner is due to ignorance of insurance medicine and what is expected of him in making an examination and filling out his report. Instruction by the Individual companies undoubtedly has led to improvement, but much more should be done. It would result in a considerable saving if this could be undertaken by the Association. There is a large field here needing better cultivation. I have asked Dr. L. G. Sykes, Medical Director of the Connecticut General Life Insurance Company, of Hartford, to discuss this phase with the idea of suggesting improved methods.

#### RELATIONSHIP WITH EXAMINERS

Dr. L. G. Sykes

Dr. Daley is to be congratulated upon so ably placing before this Association, and in such a forcible manner, the important relationships of the Medical Department in its everyday work. He has done much to set us thinking on improved relationships which generally solve problems. Our handling of Medical Examiners is a real problem. It is our duty and responsibility to look at things as they are and also to look into the future as best we can to see where we are headed.

I believe that we are at a very critical period with regard to our Medical Examiners because of our joint lack of foresight in realizing that we cannot antagonize and at the same time influence the medical profession. Certain changes are and have been taking place in life insurance which have affected and are vitally affecting the medical profession. Have we not forgotten that there is a tendency to oppose that which a person does not understand? This particularly holds good in this instance. We, as part of the biggest selling business in the world, have not sold

our examiners—our representatives. We have not scratched the surface of selling to them what we want, why we do many things, or why certain changes affecting their incomes have taken place. They do not understand Non-Medical nor do they understand the widespread difference in action in Standard and particularly Substandard business. The psychological effect of this has been pronounced and I believe that life insurance examining is at as low a tide as it has been in years.

Not as an alarmist, but as one who has endeavored to look the situation squarely in the face, allow me to point out some of the things that have not added particular glory to our field relationship and where I think much can be done to strengthen our understanding:

A high-grade well-trained examiner submits facts, as he finds them, to the Home Office. He will not hide behind a cloak of confidential letters but places the facts in the Medical Examination blank and with what result? This goes on for a time and the next step is the suggestion to the examiner by the agent that he is only supposed to answer the questions asked and not add any other information. If this does not succeed, the next step is his letter to the General Agent that Dr. Blank refuses to leave his office to make outside examinations or takes an hour and one-half to make an examination or the applicants refuse to go to him because of his unpopularity in the community, etc., etc. Unless the Medical Department investigates the situation, all too frequently the examiner is dropped. He is rarely given an opportunity to place his side before the Home Office. Is it any wonder that there is a wide-spread feeling

among Medical Examiners that Home Offices do not desire the facts reported to them and that the careless, unscrupulous examiners are the ones we want? I say this without fear for such have been my personal findings in talking with examiners in various parts of the country. The concrete evidence of the examiners is that they do not get any more examinations when they give damaging facts elicited in an examination and that then someone else is appointed—maybe known to them to be unscrupulous. It is surprising to see the amazement of local examiners when they are told that we in the Home Office want the facts as they find them. Do we not also forget that an examiner is in a most delicate position, having to satisfy the Home Office Medical Department, the applicant, and the agent? His sense of security is entirely dependent upon the attitude of the Home Office Medical Department.

Are we going to allow the feeling to grow that we are not interested in first-class, honest work by high-grade examiners who are giving us facts, and that we will not stand back of our honest, capable, fearless, conscientious Medical Examiners? Is it agency pressure that has been a factor in causing the growth of the wide-spread policy of mishandling examinations or is it our own lack of thought of our examiners which has crept in because of the enormous growth of our business and our busy Home Office days? It would appear that the evidence is against us as a result of certain changes that are taking place. Do we want better examinations—honest, frank, and fact-giving? You know far better than I do how to answer this question as far as your company is concerned.

In a brief manner I have endeavored to sketch

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the background of many straight-forward reactions that I have obtained from reliable examiners in my field work. There is today a feeling of insecurity on the part of many examiners and this has not been made less pronounced by the advent of non-medical insurance.

There must be something that can be done to do away with the feeling of insecurity of honest, conscientious men who are, in many instances, giving freely of their time and effort for our great business. It would appear that in union there is strength. In this day and age when our agents attend joint sales congress, work in associations, etc., it would seem as if we should tackle this big problem and solve it by joint effort.

A study of what is being done in the handling of Medical Examiners by the member companies of this association reveals some interesting information. Seven of our members are doing personal work in instructing their leading examiners. This is a most commendable work from which they must be getting a big return. Twenty-eight companies have examiners' manuals. There are twenty-three companies that keep in touch with their examiners by correspondence or occasional visits by Medical Directors to the field. The rest use an occasional letter or circular or do not do anything to keep in touch with examiners or to set forth what is expected or wanted.

The effect of a concerted action by means of joint literature gotten out by this association covering how life insurance medicine considers the group, not the individual—although individual selection within the group plays a strong role—the mortality experience in overweight in graphic charts, blood pressure charts,

and other experience would heighten their interest. This association could well undertake the preparation of interesting literature and remove much of the mystery surrounding life insurance medicine. This association could delegate or employ speakers to appear before city, county and state medical associations, and could put over and sell an understanding of our problems. The survey shows that among the eighty-one companies responding to my questionnaire, seventy-two Medical Directors are in favor of this work and only nine are opposed to a program of concerted instruction for Medical Examiners. There is a large field for this work and I personally believe it should be done.

The foregoing has to do with our present examiners. No plan covering the scope of this field of work is complete without a survey as to what opportunity there is to reach an even more fundamental structure. Can we not reach the prospective examiners in our medical schools who are without preconceived ideas, and sell them the idea of life insurance medicine and what we really want? It could be forcibly brought out that life insurance companies are looking for honest, straight-forward, diplomatic examiners who will give us the facts.

I wrote a personal letter to the deans of our Grade A medical schools asking two questions: First, "Are the students in your medical school receiving any lectures or instruction on life insurance examining?" and, second, "Would you be interested to have presented to your senior students the aspect of life insurance medicine and the factors involved that go to make up a competent life insurance examiner?" I want to quote a portion of two replies from the deans of two of our prominent medical schools:

"We have the feeling that life insurance medical work had a tendency to set a rather lower standard for general methods of diagnosis and that this affected, indirectly, the whole medical work of our graduates."

"I am often impressed by the apparent desire of the insurance companies to get their examiners to pass up or overlook physical findings that might operate to exclude the candidate from securing a policy."

It can thus be seen that there is need for corrective work even in our medical schools. The replies to my letter evidenced an astonishing degree of favorable reaction to Question two with reference to whether they are interested to have presented to their senior students the aspect of life insurance medicine and the factors involved that go to make up a competent life insurance examiner. The provision was made, however, in many of the answers that their affirmative answer was dependent on securing a competent, qualified lecturer to present this subject to their schools. The following is a list of the schools expressing a desire or willingness to arrange for this work:

University of California  
University of Colorado  
George Washington University  
Howard University  
University of Illinois  
University of Kansas  
University of Maryland  
University of Michigan  
Washington University  
Albany Medical College  
Western Reserve University  
University of Oklahoma  
Vanderbilt University

University of Vermont  
University of Wisconsin  
Emory University  
Yale Medical School

The following schools have given a little work in this connection to their senior students but are interested in doing additional work:

Tufts Medical College  
Creighton University  
University of Nebraska  
Meharry Medical College

These schools have offered time in their crowded curricula to us. Will we meet their interest and their offer of time by action? Is it not of sufficient importance for this association to get behind and, if need be, employ someone competent to handle this opportunity? The decision is up to the association.

If it is deemed advisable to attempt a program of correcting the idea of the medical profession as to the type of work life insurance companies want and, if it is desired to reach the prospective Medical Examiners through the medical schools, this plan, it seems to me, will not be complete until we have gone a step further in offering security to conscientious Medical Examiners which will assure them recognition for their work.

The suggestion that physicians be classified, as Dr. Daley has stated, has been presented to the Executive Committee. I feel that some means must be evolved to let our Medical Examiners know that high-grade conscientious work receives the stamp of approval of the Medical Directors Association. As mentioned before, a sense of security is needed for work well

done. There should be means worked out, under the direction of this association, to classify, select, and protect competent Medical Examiners. I want to quote one of our honored members in this connection:

"It strikes me that there should be a method by which companies could get together to place their stamp of approval or disapproval on medical men in the field throughout the various districts. If we had a Bureau to which all irregularities on the part of examiners could be forwarded and such information were available to companies, there is no doubt but what it would have a great effect on the work of medical examiners throughout the country. There has been in the past, and there still is, a great deal of slipshod work done in connection with life insurance examinations. If we had a Bureau to whom we could report irregularities and if an examiner knew that any *sub rosa* action on his part might jeopardize his standing with all insurance companies, he would be more apt to play the game squarely."

The Iowa, Ohio, and Hartford Medical Directors Associations have found that a get-together on examiners has been of value and it should be for all of us. The estimated expense of the member companies for the investigation and supervision of Medical Examiners during a given year shows that a large amount of money is being spent with the coincidental duplication of effort, expense, and time. I received eighty-one of the eighty-seven questionnaires sent to the member companies and the estimated expense for this work amounts to \$123,265.39 for a given year.

A Central Bureau would be a real service to us all if adequately managed by this association. It would hit directly the general idea now prevalent that many companies are not interested in securing the facts found on examination. Furthermore, the question-

naires show that there are sixty-six of our members in favor of a Central Bureau as against fifteen not interested because of their system of handling examiners, or actually opposed. This work can be as far-reaching as the association desires. It can and will save money and duplication of effort as well as raise the standard of life insurance medical examinations.

I, therefore, submit for your consideration and approval, first, the need of selling our present examiners what we want; second, the opportunity at this time of furnishing competent lecturers to a group of twenty-two of our Grade A medical schools; and, third, the need of a Central Bureau for classification of examiners.

Dr. Daley—When Dr. Sykes attacks a problem, there isn't much left of it. I would like to hear some discussion of Dr. Sykes' paper. It is a very important thing.

Dr. Wilson—I was very much interested in Dr. Sykes' paper, both from the standpoint of a Medical Director and from the standpoint of a teacher. In the school I have been connected with for some years past now, we have been lecturing on life insurance, taking it up from the standpoint of giving each student copies of the examination blanks and telling them why we ask each question, for instance, why the circumference of the chest is taken and I point out the fact that that is the best indication we have to proceed on. It is very easily overlooked by an examiner who is good and I think that by this means these men have been educated in a way to make an examination.

I have to take issue with Dr. Sykes in one particular. I don't think the trend is to bad examiners,

but it is not getting good examiners. I think there would be much gained by finding out who the good men are.

About seventeen years ago, when I became a Medical Director on part time, we only operated in about five states. I felt that I stepped over a large amount of dynamite as I didn't know a single one of the examiners, and I undertook the question of investigating them. I went all through the states where we did business and I wrote personal letters to each examiner and I got some of the most valuable comments possible, a frank discussion of every man and you could read between the lines in most of the cases. I wrote chiefly to the men whom I didn't have a chance to meet. As far as this Association is concerned, that data is possible in all of those states in which we do business. We could do the same thing, groups of us in different sections of the country, and get a list of names of those who would be satisfactory. I offer that as a suggestion.

Dr. Daley—Has anybody else any remarks to make on the subject? Dr. Wells, have you anything to say as to what you do in your state?

Dr. Wells—We are still continuing our work in the Association of Life Insurance Medical Directors of Iowa and find it a very great help. The list is checked over every year and changes are made in that list.

Dr. MacDonald—I feel some diffidence, being a new member of this Association, in arising to discuss a paper that has been so well presented, and yet experience leads me to point out that there is much to be said upon both sides. If our medical examiners were all well chosen and were all suitable for the work of examining and making correct reports, we

at the various Head Offices would have very little to bother with, and the work could be handled in a routine manner. But, unfortunately, there are some medical examiners who do not have a full idea of the importance of their work. I do not know whether they are altogether at fault. There are various circumstances which make it difficult for them.

I have just come from the Pacific Coast. On my return journey I called in various places, as Victoria, V. I., Vancouver, Calgary, Regina, Winnipeg, et cetera. I made it my duty and pleasure to see all the medical examiners possible, and I may say that wherever a Medical Director can see a medical examiner and talk face to face with him about the difficulties, they vanish very soon.

I notice that we have in the West some few medical examiners who do not speak English fluently. These men have not the same viewpoint that we have, and there is difficulty in sizing up the situation. In Ontario we have very little trouble with our medical examiners. I am speaking now of our Company, The National Life Assurance Company of Canada, because I have from the beginning adopted the plan which was instituted so far as I was concerned by the late Dr. E. W. Lambert of the Equitable Life, namely, to have a chief examiner in each place and one or more alternate examiners as the size of the place might demand, so that in Ontario where medical education is on a high plane, we have no trouble. We have more difficulty as we go East, in Quebec, where the medical men do not all pass the same examination and though they are very nice men to meet it is a little difficult to understand the writing of many of our Lower Canadian confrères.

Then there is another difficulty that I think it worth while mentioning and that is the habit of having what they call clinics. In the West particularly, a number of medical men specialize on various departments. They do not like to leave their offices which makes it difficult for the agents who certainly have my sympathies.

I quite think that the point brought out by Dr. Sykes of making a distinct endeavor to get together on the question of selection of medical examiners and of retaining them is very important because we find that where examiners are known to us personally we have little difficulty. I thank you.

Dr. Daley—Thank you, Dr. MacDonald. The Equitable drops about every year for poor or dishonest work about fifty examiners. We appoint about one thousand examiners a year. We make at least fifteen hundred inspections. Think of the re-duplication of that when you realize that every Company drops and appoints and inspects its own examiners, a tremendous waste. Dr. Rockwell has estimated that the Medical Directors of the Equitable know personally the examiners who do at least 80 per cent of the work, that is, by visiting them personally or their calling at the Home Office. Dr. Huston, you have some remarks to make?

Dr. Huston—It is true that a small number of the authorized examiners of any company make a large per cent of the examinations for that company. Personal contact is by far the best method of keeping in touch with them, and this can be done because of the comparatively few which make approximately 75% of all of the examinations.

I am in sympathy with the program to improve

the type of medical examiners and I believe that the place to start is in medical schools, and follow that up through our own personnel after the doctor has been approved as an examiner. Personally I see no reason why we cannot have an approved list of examiners reported through our bureau. There has been some objection raised about reporting undesirable examiners through the bureau but certainly there could be no objection to reporting an approved list. Such a list would prevent duplication of effort.

Dr. Root—May I ask, Dr. Daley, if you meant 80 per cent of the examinations made or 80 per cent of the whole number of examiners?

Dr. Daley—80 per cent of the business presented.

Dr. Patton—The Prudential has on its lists some 8,000 examiners throughout the country, but some 300 of them did about 80 per cent of the examining so far as the volume is concerned. We have for a number of years had one of the Home Office medical men, possibly half the time—not the same man but fully six months of the year someone from the Home Office—out visiting the field, calling personally upon examiners and holding sectional meetings of examiners. In addition we have highly trained laymen who are constantly in the field.

Like Dr. Daley, we discontinued some 60 men for poor or irregular work. We make perhaps some one thousand changes in the year. Men move away, men get too old for continued service, or resign because of being too busy, etc. The changes are made up of about 500 new appointments to replace those discontinued.

In addition to that, in this age of surplus business, we have for a number of years corresponded with some

twenty-five other Home Offices—many of you here have had letters from us asking for your best examiners in the large centers. We revise that list at least every year and a half and attempt to every year. It is surprising how many of those names we find are examiners for several companies. It is also surprising how many times those companies send us names of men who have died in the year, showing they have not checked their lists as we attempt to. We feel that we have in each of the large centers from 25 to 50 examiners outside our own—based upon the recommendation of the company that has them in its service—upon whom we feel we can depend for reports if we have to go outside of our own ranks. And so we believe we have a very good list of examiners in the centers from which probably 75 per cent, at least, of our business will come.

Dr. Righter—Perhaps you would be interested to know that about ten years ago a small group of southern Companies operating in the southeastern section organized an exchange bureau of examiners. We have in our files in the Atlantic cards remaining from a discontinued bureau of that sort. The amazing part of the whole proposition is the fact that the majority of the Companies could give no opinion on perhaps 85 per cent of their examiners. We had a rating system, which could be favorable or unfavorable, and there apparently was an indication that we do most of our business with those concerning whom we know nothing. I still believe that such an exchange system on a favorable basis or ability basis is possible and believe it is one of the most valuable things that could possibly be done in our work.

Dr. Alton—This controversy is a matter that has

interested me for a good many years. From our dealings with examiners and so forth, I think that the securing of life insurance and issuing of policies stands on a tripod. There is the Agency Department, which secures the risk, the Underwriting Department, which passes on the risk, and there is the Medical Examination, and that is the weakest thing in the whole process of securing insurance. I sometimes say in talking with the officers at home: "You're all interested in quantity and you forget about the quality."

Now many of us do not go out of our way to teach our examiners how to examine and classify the conditions they may find. They pass them by and we get them. (I am speaking for the Connecticut Mutual, Mr. Chairman.) A case in point: Only a short time ago we had the case of a man with a "functional murmur" and he died within a year.

Now the immediate contact that the Medical Department of a Company has with its medical examiners is the correct way in which to insure a higher grade, a finer quality, of examinations. When we allow the Policy Department to write a medical examiner on medical matters, I think we are commercializing our relationships with our medical examiners. I believe that every communication to a professional man should be by a professional man. I don't believe in commercializing the whole corps of medical examiners as we are doing every day. It enters into our general method of securing life insurance, to be sure, but I believe, as suggested by the Equitable, that immediate contact with the medical examiners is the thing that is going to give us the quality and, I hope, reduce our large losses.

Now take the matter of fees. I can look back upon the time in the last century when we paid medical examiners three dollars for each examination, but we didn't require the examination of today. See how simple matters were. That was fifty years ago. About forty years ago, we made a change and instead of giving him two dollars extra for an occasional examination of urine, we increased the fee to five dollars and required the urinalysis in each case. That was forty years ago. Of course, medical fees are just the same today. They cost just the same today. We only require from our medical examiners just what we required forty years ago. You see the humor in that, gentlemen. Yet, we require now one or two extra blood pressures, we call for one or two additional specimens of urine and the common rule is not to pay our examiners a cent extra. "Oh," you say, "he gets a large number of cases. He ought to be willing to run out of his office and make the inspections." True enough. One doctor told me he had spent two and a half hours on one examination, for which he received a fee of five dollars. The next year he got tired of that and sent in his resignation. I don't blame him at all. We don't treat our medical examiners on a professional basis. We keep them commercialized. We get just as much out of them as possible.

I talk with medical examiners frequently. I write to them more frequently and I find that that contact with the medical examiners is the thing that gets the loyal man working for your Company in the proper field, the medical field. I well recall one young physician I selected in a western city, one fully qualified, a man of fine character, but I found upon

his first examination he hadn't the right idea of what a life insurance company required. I took the matter up with him and wrote him and within two years' time he was one of the best medical examiners we had in the United States. Now the quality is there if you will only instruct it. I don't think that we can get the instruction through our medical schools. We have to take our individual examiners and teach them the things that we require. I say what *we* require; you require something different. Each company has a little different idea.

Some ten years ago, in talking on medical examinations before a meeting of this Association, I suggested that the Executive Committee take under serious consideration a standard form of examination. Of course, nothing has been done; I didn't think anything would, but it was my idea for years that we might have a standard form. I have sat down many times with doctors and they say: "The different examinations of different companies puzzle me so that I can't keep any of them in my mind." Of course, there are a great many differences of opinion and it is very hard to get great minds together and consequently we can't get a standard form for an examination, but I do feel that if we ever get to it, that it would save us a great deal of trouble and would assure us much better service. The medical examiner, if he knows the form by heart, could sit right down and make his examination and send in his report. The policies are not held up by the application being sent back because the doctor had omitted the answer to this question or that question.

Now things of that kind are coming along every day to interfere with the action on business, but the

one great thing I have in sympathy with the medical examiners is the present requirement of so much medical work and the fee is just the same as it always was. I was talking to one doctor and he said he received a fee of two dollars extra every time that he took an extra blood pressure, yet I had a questionnaire from the Company for which he examines and that Home Office said "No" to my question, "Do you pay a fee for extra blood pressures?" I knew from the Medical Department that the fee wasn't paid. I inquired and found that the agent paid the doctor that extra two dollars. In time he becomes the agent's doctor, not the medical examiner for the Medical Department of the Company. You see how it shifts over to the commercial and you want to regard and keep it professional rather than commercial. (Applause.)

Dr. Daley—Thank you, Dr. Alton. The Chair is reminded to appoint a committee to crystalize this report to the Association. If there is no objection, this will be done. Now we will proceed with the papers.

#### THE ACTUARY

Dr. Daley—In every company, the Medical Department is brought more or less in constant relationship with the Actuarial Department. The Actuary takes as one factor the duration of the life of human beings, and as another factor the monetary value of life, applies the science of mathematics, and brings out tables of mortality and schedules for payments upon which life insurance contracts are based. He makes the principle of life underwriting scientifically sound.

It is the application of this principle to the individual that comes within the jurisdiction of the Medical Department.

In an address of welcome to this Association when Dr. Hobbs was the presiding officer, Mr. Darwin P. Kingsley, President of the New York Life Insurance Company, remarked that "the only part of a life insurance company which was not scientific was the Medical Department." As long as medicine is more of an art than a science, this condition must maintain. It requires art to apply scientific principles correctly, so we must infer that a good Actuary must use art as well as science in his endeavor to classify individual lives so that these classes may be as homogeneous as possible. The Medical Director needs the advice of the Actuary.

I have asked Mr. Robert Henderson, the Second Vice-President and Actuary of the Equitable Life Assurance Society, honorary member of this Association, to give us direction and advice toward uniformity in selection, applying it not alone to an individual company, but to all companies. The more accurately we make our classifications, the less discrepancy there will be in our action on cases.

#### RELATIONSHIP WITH ACTUARY

Mr. R. Henderson

In considering the relations between two classes of people it is well to bear in mind the special characteristics and functions of each class. As I am addressing a group of Medical Directors who doubtless know more about their own characteristics and functions in the life insurance business than I would be able to tell

them in twice the time which I propose to take up this morning we may for the present take that side for granted trusting that whatever tacit assumptions with regard to them may creep into my remarks will meet with your concurrence.

As I belong by training and present profession to the other group it may not be amiss for me to say a few words regarding it. Just as the Medical Director is at the foundation a physician so the actuary is primarily a mathematician, more or less. I have used the qualifying words "more or less" because it cannot be claimed that there are many, if any, actuaries who would rank as mathematicians with the leaders of that profession or, say, with the average professor of Mathematics in a first-class university or who could understand much of the language they talk when they start an advanced scientific discussion. I am free to admit that I do not.

In spite, however, of this fact it is unquestionably true that very few who were not endowed to a considerable extent with the mathematical cast of mind have ever entered the actuarial profession and practically all so engaged have added to their natural trend a considerable amount of mathematical training. In fact, no one can become a member of one of the leading actuarial societies without first exhibiting to the Examination Committee satisfactory results from such training.

Just, however, as the Medical Director is a physician who has specialized in the application of Medical Science to the business of life insurance so the Actuary of a life insurance company is a Mathematician who has specialized in the application of Mathematics to the problems peculiar to that business. When, there-

fore, the Medical Director and the Actuary are collaborating on any problem the former would be expected to contribute such light as would be thrown by a knowledge of the anatomy, physiology and functioning, including pathology, of the human body while the Actuary will contribute a mathematical analysis of whatever data may be available particularly the derivation from actual experience of rates of mortality and the translation of those rates into premiums.

Just also as the physician who decides to take up the duties of Medical Director of a life insurance company will probably find that certain parts of his previous study and experience are more useful in the new work than the rest so there are certain branches of mathematics which have more particular value to actuarial work than the others have. As it is the duty of the Actuary to make calculations regarding financial operations extending over a long period and involving the accumulation and investment of sums of money in order that they may be available to meet obligations when due it follows that he must be familiar with the operations of compound interest. This necessity he shares, however, with many other people and the Medical Director is not likely to come into contact with this element of his work except in the most general way. It will not be necessary for us to dwell further upon it.

The other branch of Mathematics which enters most largely into Actuarial work is of more modern origin. While it is doubtless true that the idea of chance and the use or manufacture of chance events for mathematics did not commence until in 1654 a problem gambling purposes extends back to prehistoric times the systematic treatment of them as a branch of arising out of a game of chance was submitted to

Pascal and by him discussed with Fermat. I may here interject that these names may perhaps be unfamiliar to many of you. It just so happens that the Theory of Probability has a rather distinguished origin, because these two men were by common admission the two most prominent mathematicians in the world at that moment and were the collaborators at the origin of the theory of probability. Newton was at that time going to school and had not yet developed his towering mathematical genius which followed a few years later, and the giants of the preceding generation had all passed off the stage. So these two men were the acknowledged leaders of the mathematical profession at that time. The doctrine of chances or as it is otherwise called the Theory of Probability thus had its origin in games of chance and this necessarily influenced considerably its early development although its most important application from our viewpoint has been to insurance which, from the side of the insured, is the exact reverse of gambling. Just as gambling creates for us financial uncertainty and instability which had not previously existed so insurance destroys, so far it is true insurance and is effective, previously existing financial uncertainty and substitutes stability.

In the earlier days of scientific life insurance the chance event with which actuaries were concerned was the death or survival of the person whose life was insured but in recent years he has had to consider also the chance that death when it happened might be due to accident and also the chances of the insured becoming totally and permanently disabled and the chances of those so disabled recovering or dying. In order that all of these chances may be made the

subject of mathematical calculation they must be measured numerically and peculiarly enough when it is considered that chance or uncertainty is the subject-matter under consideration the unit adopted is certainty.

When the Theory of Probabilities was first developed it was natural, as it arose out of games of chance, for this measurement to be made by analyzing in such detail as might be found necessary, the possible outcome of the game into a number of different ways which could be considered as equally likely. The ratio of the number of ways that give the particular result under consideration to the total number of ways was then taken as the numerical measure of the probability of the result. This method of procedure is not, however, directly applicable to the chances of a life insurance policy. It was shown, however, that if a very large number of trials were made the proportion giving the result in question would probably be very close to the probability of the result on an individual trial; or in other words that the equally likely ways of happening would tend to occur equally often (in the sense that the ratio of the least frequent to the most frequent would tend to unity, not because the absolute difference would tend to zero but because this difference would increase so much more slowly than the items themselves as to become by comparison negligible). If, therefore, we observe the number of deaths out of a large number of some class exposed, we have an approximation to the probability of death in the class from which the exposed were drawn, which will become more reliable as the numbers observed increase.

When he comes to practical application, therefore, the

actuary must rid himself of any preconceptions he may have derived from the fixed and definite values of the chances in games of chance and remember that his probabilities are at best only approximations to the chances of the game as they stood when the observations were made and that when they are applied at a different time the possibility of the rules of the game having been changed in the meantime must be taken into account. Perhaps this cannot be better illustrated than by referring to what is being done in connection with the occupational mortality investigation now in progress where in order to avoid the fallacy of comparing the experience at one period in a given occupation with the standard mortality of an earlier period the companies were asked to contribute their standard data for the same years of issue and of duration as the occupational data. It is considerations of this kind with which the Actuary's training and experience qualify him to give intelligent advice and make it difficult for the individual company to accumulate sufficient experience of its own on special classes from which to draw satisfactory conclusions. At the same time the experience of other companies cannot be counted upon unless the company's methods of selection as applied to that class are in harmony with those of other companies. This is illustrated by the radical differences in experience sometimes announced by different companies on what appear on the surface to be the same classes of risk.

All rates of mortality are probabilities and all probabilities relate to particular classes under particular circumstances. Before assuming, therefore, that the results of a particular experience will be repeated

we should consider not only the volume of the experience but also whether the class of risks and the circumstances to which we are looking for a repetition are the same as the original. For this reason as much uniformity of treatment and classification by the different companies as is practicable would be desirable in order that by joining forces a fairly reliable experience may be obtained and that the individual companies may know to what class of their own applicants the results may be considered as applying.

After listening to the discussion on the Relation of the Medical Director with the Medical Examiner, let me add that at the foundation it all hinges back to getting accurate information from the original sources, be they medical examiners or otherwise, with regard to the risk upon which we are acting. If our foundation is built on shifting sands and if one Company is going to get one set of facts from its medical examiner and another Company an entirely different set of facts from its medical examiner, neither Medical Director nor Actuary can build a solid and consistent building on that foundation. I thank you. (Applause.)

#### THE UNDERWRITING DEPARTMENT AND EXECUTIVE HEAD

Dr. Daley—The Medical Department is associated in its everyday work with the Underwriting Department; this brings it in contact with that executive who is responsible to the President or Board of Directors for the results of underwriting. Rather than present the relationship from the medical side, I have asked Mr. Henry Moir, President, The United States Life Insurance Company, to let us see ourselves as our officers see us, and I believe we may profit from what he has

to tell us. I have also asked him to give this Association all the help he can by suggestions tending toward uniformity in action in respect to one of our pressing problems, "The borderline case."

#### RELATIONSHIP WITH EXECUTIVES

Mr. H. Moir

The ideal executive of any big corporation is the man who knows the broad principles of every department of his organization, and in addition can quickly appraise and classify human character. This ideal is so rarely attained that most people now say that the best executives are those who have the faculty for surrounding themselves with a group of able captains.

The relationship between the executive and the medical department of a life insurance company is facilitated by the fact that medical men go through a long course of careful scientific training; and, before a man is even considered for the position of medical director it is looked upon as a *sine qua non* that he must be a qualified physician, from a good college, with a broad experience in medical practice. This requirement eliminates 90% of the undesirable element which may creep forward in other less scientific departments and attain positions of prominence. The result is that the medical department of a life insurance company ranks with the actuarial department for the integrity and upright character of its officers. In both these departments the unworthy and the unfit are dropped by the wayside in the long course of persistent work on scientific lines. The mental and moral weaklings drop out of the race. It follows that the relationship between the executive department and the medical department is generally one of friendly co-operation.

On the other side, the ideal medical director not only has a broad scientific knowledge of the principles of selection, but also a warm human sympathy for the agent. The scientific knowledge is nearly always present; but it is not so common to find that the medical man can parry genially and with a smile the thrusts of the agents—nor does he always tactfully hide his true sentiments when meeting an agent he may distrust. He should always give an *appearance* of confidence in the statements of the agent on questions of moral character, or habits or purported facts regarding the applicants. Under such circumstances there is rarely any serious disagreement. But such ideal conditions seldom exist, for even if the medical director is tactful, the agent may be bull-headed and evasive. Then discussion over rejected cases may become heated. I have seen needless warmth on both sides—the agent who says his medical director is the strictest in the world; the medical director who will not listen with patience to any phase of the risk submitted by the agent.

When a life insurance application is received the relationship of the agent to the medical department immediately appears. Agents submit the business; the companies do not always accept it. The blame for the rejection and loss of income in the agent's mind nearly always rests upon the medical department. An ideal mortality with no deaths can only arise in one way—by having no business. The other extreme is that every case submitted by an agent be accepted without question. Either course would soon close the doors of the company—a balance is essential.

Under ideal conditions, the agent will only submit cases in which he has personally complete faith. The medical director wants to accept all possible business

—that is, all coming within a broad margin above and below the average standard risk. When an adverse decision is rendered the ideal agent will accept it cheerfully and go out with renewed vigor to find a healthy risk to take the vacant place. It will therefore be seen that there is in this department of the work much room for mutual forbearance and especially for confidence and straightforward integrity.

There are occasions in which the medical department is placed in a position which must be galling to high-spirited men.

Agency men, by their training and character, are persistent to an unusual degree. Their experience in soliciting business is that genial pertinacity often succeeds in circumstances which look the most hopeless. An agent gets a point-blank refusal; having turned the conversation to another channel for a few minutes, until his prospect is off his guard, he comes right back to the same subject again from a different angle. He does this time and time again on different visits, and finally secures the application. This characteristic system of the agent is often applied to the medical department in urging the acceptance of borderline cases. The result is that a high grade agent of genial manner may get an acceptance under conditions where the coldly scientific decision would be adverse. Moreover, the good agents often apply the same tactics to the executive direct, and argue with him, especially in those cases where the cause of impairment is not strictly medical. If clemency is shown, the medical department gets credit occasionally, but not often. When a definite refusal is in mind the executive will say:

"I shall take this question up with the proper officers. You know I don't handle such matters myself."

Then later, when the agent makes his second appeal, as he always does:

"I am sorry to say the Medical Director is so thoroughly against this case that I cannot prevail on him to accept it."

The hardest task the medical department has is to maintain its proper scientific attitude towards the business as a whole, while suffering these pin pricks which may be more or less numerous according to the character of the particular executive.

The doctors should from time to time meet the agents on friendly terms and in conditions where the selection of risks is forgotten as a minor consideration; on the golf course, around the bridge table, at conventions, travelling together, etc.—in places where they can chat about one another's hobbies. Generally, if such circumstances occur with sufficient frequency, all the good class agents should and do realize that the medical director is sincerely endeavoring to accept all the sound business submitted and—I think we can say this of every medical director in the business—at the same time that he is a good-hearted human soul, with sympathy for the agent and trying to see the agency viewpoint. When the agents once get to this relationship with the medical director the association between the medical director and the executive is greatly simplified and becomes one of complete friendly co-operation.

The foregoing remarks seem to deal more with the relationship of the Medical and Agency Departments, rather than the Medical and Executive. The reason

for this is simple—namely that one of the hard duties of an executive is frequently to sustain the Medical Department, and appease the growling discontent of agents at adverse decisions. There are always borderline cases which may be subject of argument and the executive should see that such arguments are candid and friendly on both sides. The best results are achieved when the executive plans the broad lines of policy in conference with the medical director and leaves all individual cases to a committee decision. My own personal sympathies are mostly with the medical men whose patience is often sorely taxed; yet the friendly co-operation of the agents must also be secured, and to maintain an even balance between the two departments is one of the most interesting functions of the executive.

THE ASSOCIATION OF LIFE INSURANCE MEDICAL  
DIRECTORS OF AMERICA

Dr. Daley—The relationship of a medical director to this Association is always a happy one. We are kindred spirits. Our cares, trials, problems, experience and ideals are the same. Their recital wakes responsive chords in our breasts. Our meeting place becomes an Elysian Field. Each is a brother Pan, and in our happy annual reunion, we are at times inclined to overlook as an Association the obligations incurred in its formation. Much has been done by it in the matter of improving relationships between its component members to bring it to that present happy state. In accomplishing this, life insurance in general has been benefited. As the citizens in a community must give up some personal rights and privileges for the benefit

of all, so through this Association, agreements have been made whereby the different member companies have discontinued certain of their customs, and have worked in agreement for the safeguarding of life insurance. As in our own government, what is good for the United States is good for the state; what is good for the state is good for the individual. Applying this principle to life insurance, let us pass on to our relationships as medical directors in association to the final chapter of this programme:

#### THE BEST INTERESTS OF LIFE INSURANCE

At the time of the World War, the United States firmly established life insurance as a commodity, and also indicated its desirability. Subsequently, the coverage of life insurance increased at a tremendous rate to its present peak.

During this time, life insurance companies, nearly as a unit, entered into the field of disability coverage and added a Double Accident feature to their contracts. These facts, together with new medical impairments, shell shock, gassing, etc., resulting from the war, have tremendously increased the indefinable and unmeasurable part of the hazards with which the Medical Departments have to deal. In other words, the doubtful or borderline cases have increased to such an extent as to cause considerable concern among underwriters, medical directors, executives and administrators who try to do their work scientifically, and who feel that any tendency toward haphazard selection is unfavorable to life insurance in general.

The reasons leading up to difference in selection by various companies toward the same individual, or bet-

ter still, the same set of facts regarding an application may be summed up as follows:

1. Difference in the degree of mortality experience that different companies desire.

2. Tradition, personal opinion, unfavorable experience, usually recent and acute, regarding one or more factors of the risk both as to life and disability experience. This is again further multiplied by

3. Different pictures produced by written descriptions of the same factor by examiners or reporters; this, sometimes, notwithstanding a uniform system of selection, such as the numerical one, and the use of form letters restricting the answers toward a set type.

It would seem from the above variants that the problem of consistency in the underwriting of borderline cases is insurmountable, but this Association was originally organized for the purpose of overcoming just such conditions, and I believe if we get our heads together we may eventually bring some degree of order out of the present chaos in the handling of borderline cases.

Let me here say one word regarding a system of selection, tried and proven, which tends to uniformity—the numerical system.

This method of selection of risks by giving numerical values to debits and credits presented by an applicant leads to uniformity, not only in any one company but between companies. It also makes the work of the Medical Department understandable to the other departments handling the cases. Where a definite value has been agreed upon for nearly every factor which goes to make up a risk, and these values made easy of access and interpretation in book form, it serves as a

translation of medical terms and pathological processes that can easily be comprehended by a nonmedical person. It takes the mystery out of medical selection, and automatically brings to the aid and assistance of the Medical Department in its work of selection, not only the underwriting part of a company, but also its executives. One man among us has been a master in this respect. He has shown us that mortality statistics need medical interpretation; that accuracy in selection is necessary to intelligent insurance underwriting. He introduced and described to us the numerical system. He pointed out to us the salvage in underwriting, the so-called substandard business. By freely presenting the mortality statistics of his own company, he has led others to do the same, one of the greatest helps toward uniformity of selection ever given to this Association. \*

I will not dwell on the many other things he has done for this Association, as they are to a degree outside of the scope of this paper. I do know he is keenly alive to the harm done to life insurance by the lack of uniformity in selection, so I am asking Dr. Oscar H. Rogers, Medical Director of the New York Life Insurance Company, Ex-President of this Association, Member of the Medico-Actuarial Investigation Committee, Chairman of the M. I. B. Committee, etc., to address us on this subject.

#### RELATIONSHIP WITH EACH OTHER, AND INSURANCE IN GENERAL

Dr. O. Rogers

Our President has asked me to speak upon the relationship of medical directors with each other

and with insurance in general. My acquaintance with Medical Directors, other than those of my own company, began 35 years ago, when I became a member of this Association. In the following year, through circumstances entirely outside of my own merit, I was chosen secretary of the Association and was thus brought into intimate relations with the brilliant men who were at that time its leaders. Dr. Edgar Holden of the Mutual Benefit was then president of the Association. He was followed by Tabb, Shepherd, Hamill, Fisher, Willard, Wilkins and Symonds, a splendid array of scholarly, efficient and able leaders. Dr. Daley has not overstated the many benefits which all of us have derived through contact with these men and with one another and through the many discussions which we have had of subjects of common interest to us all. Indeed, each year has seemed to be of greater value to all of us than the preceding one. I feel very grateful that it has been my privilege to enjoy these intimate contacts for so many years.

But with regard to our relations to life insurance in general, I am not so completely satisfied. I am not sure that we have been doing all that we could do toward the advancement of our common interests. It is true that we have gained much. But I believe that we have not improved our time and effort to the best advantage. There has not been sufficient co-operative effort and in this respect we should be doing more. So far back as 1916 my distinguished colleague, Dr. Arthur Hunter and I, in speaking of the Medico-Actuarial Investigation, said, "Our Societies can engage in no more valuable enterprise than to complete the work of the Medico-Actuarial Investigation by preparing and recommending for general use among the companies stand-

ards by which to measure the value of lives for insurance." In 1919 at a joint meeting of the Medical Directors Association and the Actuarial Society, Dr. Hunter and I laid before the two societies a Numerical Method of Determining the Value of Lives for Insurance, in which we presented our basic ratings for build and family history, gave our ratings for various occupations and for various medical impairments. At the same meeting Mr. Henderson, actuary of the Equitable Life Assurance Society, presented these same standards converted to terms of a single build table, a build table of best weights for all ages—so that since 1919, in one form or another, these standards have been available and I think have come to be generally used throughout this country and to a considerable extent abroad. Since then, too, a great deal of valuable work has been done with respect to individual impairments. Our fund of knowledge regarding them has been steadily increasing but there has been no co-ordinated effort made either to test these standards of 1919 or to co-ordinate these later contributions with them so as to build up a complete system of medical selection; nor any attempt made to give the life insurance world as a whole the benefit of this steadily increasing knowledge. The result is that, while medical selection among us is much more systematic than it formerly was, it has by no means attained the precision and uniformity that we have a right to expect. We see every day borderline or even distinctly substandard cases which we are called upon to accept because some others of us have accepted them. Only a few days ago I had an opportunity to study rather carefully an aggravated case of this sort. Nearly ten years ago a certain risk had already secured \$750,000 of insurance. Six years ago he evidently attempted to secure more insurance for there were five

adverse reports lodged against him. In the following year two more adverse reports appeared; in the year after that he secured in the neighborhood of \$250,000 of additional insurance, although reported upon adversely on five occasions. In the next year, although reported upon adversely some seventeen times, he secured nearly half a million of additional insurance in fourteen companies. In the year after that he secured \$120,000 additional insurance through fifteen companies although reported upon unfavorably some eleven times and during this present year he has added \$30,000 of insurance, although reported upon unfavorably nine times. Thus, there have been accumulated on this life nearly one and three-quarter millions of insurance and he has been reported upon unfavorably 49 times. The mortality to be expected in a risk of his sort is certainly well above 200% and this vast amount of insurance has been accumulated by persistent effort and the playing of one company against another. Such risks are accepted by one company because another company has seen fit to accept them. They are not fair risks and should not be so treated and they would not be so treated if life insurance companies made use of standards of selection, the result of the co-operative effort of all of us. Life insurance companies owe to themselves, to one another and to the insuring public that this state of affairs shall be corrected.

A short time ago it was my good fortune to review a quite remarkable piece of work that has been done by the Canadian companies. In Canada the executive officers, medical directors and actuaries, acting through a committee, have prepared and made available for all Canadian companies a set of standards for use in their selection of risks. This committee has been meeting

from time to time, has received reports from sub-committees regarding details of common interest, has modified their standards whenever necessary so as to conform them to the latest information and so they have been building up in their country uniform practice in the selection of their risks. In a recent personal communication Dr. Seadding says, "So far as the field is concerned, the result of the effort has been magical and the education of medical advisors has advanced a hundredfold. There never was the slightest opposition to the scheme. Without it I am confident insurance medicine in Canada would still be wallowing in the mire of empiricism. As the result of it, we have contributed something to general medicine and, in the future, contributions will be far reaching and highly important, not only to the companies and the insuring public but to society at large." At a recent meeting of the Actuarial Society it was proposed to undertake a new investigation of medical impairments largely along the lines of the Medico-Actuarial Mortality Investigation. In furtherance of the scheme of co-operative effort for which I am appealing, I offer the following resolution:

Resolved, that the Medical Directors Association concurs heartily in the recommendation of the Actuarial Society of America to undertake a new mortality investigation of medical impairments and advises that the work be undertaken by the Joint Committee on Mortality of the Actuarial Society and of this Association.

Dr. Rockwell—I think we are all in one accord on one thing and that is this: That supposing a case is examined by two perfectly competent examiners on a certain day and they fill out the papers of several life insurance companies from the data which they have

obtained; the results revealed by the examination, inspection and all are identical. Wouldn't it be wonderful if each one of those companies would issue comparatively the same contract instead of modifying it as we see it done every day by the individual companies? This step adopted by the Actuarial Society of a resolution presented by Dr. Rogers is certainly one in the right direction. There can be no argument about it that I can see nor any objection, and it is with pleasure, Dr. Rogers, that I second your motion.

Dr. Daley—This is one of the best things that has been presented to this Association in my memory since I have been connected with it. It is what we need. Gentlemen, you have heard this motion made and seconded. What is your pleasure? All in favor of it please stand up.

(Everyone stood up.)

Dr. Daley—Your resolution, Dr. Rogers, is unanimously adopted, as it should be.

Dr. Rogers—Many of the members of this Association have been doing most valuable work to advance the science of the selection of risks. For example, we owe to our colleagues of the Metropolitan Life our present splendid facilities in the examination of the urine. Our friends in the Prudential have made valuable contributions in the same field. In studying impairments of the circulation, the work of our colleagues in the New England Mutual is beyond praise and at the present time several of us are doing work in glycosuria which is bound some day to yield very valuable results. Have we not now reached a time when we should endeavor systematically to co-ordinate the information which has been accumulated and is now being accumulated and to

formulate our results in such form as to be available for the use of all life companies? I know of no body of men more favorably placed to study this subject than the present Medico-Actuarial Committee and its successors. I know of no group of men who might carry greater weight in the life insurance business and I earnestly recommend that this Association request that committee to take up the entire subject from this point of view and give out from time to time results of their deliberations. I therefore offer this resolution:

Resolved, that this Association requests the Joint Committee on Mortality to make a systematic survey of the procedures now in use in this country and in Canada in the selection of risks and of the material now published or which may hereafter be published bearing upon the factors which influence mortalities and to prepare mortality ratings which may be employed as guides in the selection of risks and to so publish them from time to time that they may be available to all life companies.

Dr. Willard—I want to second this resolution because of a very intimate knowledge of the working of the M. A. M. I. Committee during its long service. The ruddy faced and white haired Nestor, who has been addressing you, has been one of the most industrious members of that committee and one of his great ambitions is to secure such reasonable uniformity of action on the part of various companies that the work of selection shall be more intelligible to the agency force and to the public in general. When the results of the study have been made available for use by the companies generally, there will be if not a greater uniformity, at least a smaller amount of diversity in decisions. On that Committee is another extremely in-

dustrious man, absolutely hungry for work, Arthur Hunter. Dr. Rogers referred to him as "Dr." Hunter. He is Dr. Hunter. I have seen his cap and gown. (Laughter.) He is an honorary member of this organization and two such splendid men directing and guiding that committee are going to produce very very wonderful results. I therefore second this resolution very very earnestly.

Dr. Daly—You have heard this resolution moved and seconded. All those in favor of this resolution will please arise.

(Everyone stood up.)

Dr. Daley—Dr. Rogers, your resolution is unanimously carried. Gentlemen, I hope you all realize what this means for life insurance. It means uniformity and I wish to thank Dr. Willard for his remark that Dr. Rogers has always been seeking uniformity not for the sake of uniformity itself but for the sake of doing things in the right and correct manner and in judging facts correctly.

Dr. MacDonald—Mr. Chairman, might I ask what has been done in the way of establishing uniformity of medical reports? Would it not help this committee very much if we had uniformity of medical reports?

Dr. Daley—Doctor, that is one of the things that we have tried to do and failed, not necessarily because of the differences of opinion between the medical directors here but because it meant we had to carry the executives along with us and some of them did not want to change their blanks and in some companies it meant changing their entire filing systems as to size and shape. Some day we are going to come to it. I notice that when I examined one of these large cases that quite a number

of the companies have blanks that are pretty nearly similar. The Connecticut Mutual, the Connecticut General, the Phoenix, the Equitable and New York Life blanks are quite alike.

Dr. MacDonald—It would facilitate the handling of reinsurance to such an extent that it seems to be worth while to make a very great effort.

Dr. Daley—I hope that the committee which I am to appoint in connection with the education of examiners and so forth may touch on that subject. Possibly if we keep hammering at it a little bit and a little bit we may ultimately get what we want.

The next thing on the program is the statistical paper from the Northwestern Mutual Life Insurance Company. These statistical papers which have always been presented by Dr. Fisher have been greatly appreciated by all the members here. Unfortunately, the doctor cannot be with us this year. We regret this sincerely, but he has asked Dr. Gilchrist, of his company, to present some statistical matter. Dr. Gilchrist.

## STATISTICAL PAPER

JOHN W. FISHER, M. D.

*Medical Director, Northwestern Mutual Life Insurance  
Company*

Presented by Ralph T. Gilchrist, M. D.

Dr. Gilchrist—Gentlemen: The statistical work upon which the Northwestern Mutual Life Insurance Company has been engaged this year is not completed, excepting the results obtained in two small groups. The particular details which I present today were only completed on the 20th inst. and came into my hands yesterday.

The first group is a small one of 1502 cases of simple goitre, goitre history, or history of goitre operation, which have been accepted by our company and the mortality determined. In this group, of 1502 cases, the mortality in the first five years at all ages was 77.33% of the expected mortality according to the A. M. table. The experience after five years upon all ages was 67.05% of the expected mortality. The entire group of 1502 cases accepted gave an experience of 72.98% of the expected. Thus it will be seen that we have had a satisfactory experience, inasmuch as our general average is about 77% of the expected. 192 out of the 1502 cases had been submitted to operation at some time prior to acceptance. 186 of these had been for simple goitre. Of these, six have since died, giving us

an experience of 78.63%. 6 of the 192 cases had, at some time in the past, submitted to operation for toxic goitre. None of these 6 have died to date.

The second group upon which we have completed our work demonstrates our experience with cases accepted for the limit amount in our company. This group comprises 4978 exposures. The determination has been made upon the approvals of 1898 to 1926 calculated to the policy anniversary in 1927. Our experience on the entire group has been found to be 78.3% of the expected. We have analyzed the group further as to insurance in force. Four groups have been determined, which are:

A—Previous Insurance in Force Full New Amount Delivered.

B—Previous Insurance in Force Full New Amount NOT Delivered.

C—No Previous Insurance in Force Full Amount Delivered.

D—No Previous Insurance in Force LESS Than Full Amount Delivered.

Our experience in Group A was 77.4% on 2,628 cases. Our experience in Group B was 74.5% on 1,037 cases. Group C gave an experience of 82.9% on 775 cases. The experience in Group D was 86.4% of the expected on 538 cases.

An analysis of the causes of death shows no apparent increase in deaths from Cancer, Tuberculosis, Apoplexy, Organic Disease of Heart, Pneumonia, Appendicitis or Nephritis, as compared with deaths from all causes during recent years. Deaths from Angina Pectoris and Suicide are twice as high as the Company's general experience.

Full details occur in the accompanying tables.

## Thirty-Ninth Annual Meeting

Mortality Risks accepted with simple goitre history, goitre operation, or goitre found present on examination

Issues of 1909-1924 to anniversary in 1927

TABLE I

Ages at Entry	Basis Lives						A. M. (Select) Table					
	First 5 Years			After 5 Years			All Years					
No.	Exp.	Act.	%	Exp.	Act.	%	Exp.	Act.	%	Exp.	Act.	%
16-19	163	2.30	3	130.43	1.42	1	70.42	3.72	4	107.52		
20-24	378	5.83	4	68.78	4.31	2	46.40	10.14	6	59.17		
25-29	313	5.01	4	80.00	3.19	3	94.04	8.20	7	85.37		
30-34	256	4.31	4	92.80	2.84	1	35.21	7.15	5	69.93		
35-39	179	3.48	1	28.73	3.03	0	0.00	6.51	1	153.73		
40-60	213	7.52	6	79.78	6.09	7	114.94	13.61	13	95.51		
Total	1,502	28.45	22	77.33	20.88	14	67.05	49.33	36	72.98		

TABLE II

## CAUSES OF DEATH

Causes of death	Simple goitre without operation			Goitre with operation			Total deaths
	No. deaths	Ave. age at issue	Ave. duration	No. deaths	Ave. age at issue	Ave. duration	
Cancer	3	38	11 yrs. 2 mo.	1	41	1 yr. 1 mo.	4
Influenza	6	25	4 " 0 "	—	—	—	6
Diabetes	2	23	6 " 0 "	—	—	—	2
Tuberculosis	4	21	3 " 10 "	—	—	—	4
Brain Tumor	1	32	3 " 8 "	—	—	—	1
Encephalitis	1	50	4 " 10 "	—	—	—	1
Angina Pectoris	1	40	4 " 6 "	—	—	—	1
Cardiac Dilatation	1	54	7 " 9 "	—	—	—	1
Pneumonia	2	39	7 " 4 "	—	—	—	2
Appendicitis oper.	3	28	6 " 6 "	—	—	—	3
Gall Bladder disease	1	47	6 " 7 "	3	52	5 " 5 "	4
Casualties	3	31	5 " 5 "	—	—	—	3
Suicide	2	56	5 " 11 "	2	38	2 " 7 "	4
Total	30	32	5 " 9 "	6	44	3 " 9 "	36

192 out of the 1,502 cases shown in Table I were risks on which an operation for goitre had been performed. Of these 192 cases, 186 had been operated on for simple goitre, with six deaths, showing a mortality of 78.63%, while 6 had been operated on for toxic goitre, with no deaths.

Mortality Experience of the Northwestern Mutual Life Insurance Company on Lives approved for \$100,000 or more of Insurance as shown in the following tabulations

Basis: Lives Am. (Select) Table

	\$100,000 limit adopted	Dec. 15, 1898	No. of Lives	Average Age	Average Duration	No. of Deaths	Mortality A. M. Table
From date of approval to policy anniversary in 1916			1305	43	6.7 yrs.	75	75.8
From " " " " " " " " 1919			1305	43	9.4 "	123	83.8
From " " " " " " " " 1923			3169	42.6	6.9 "	214	78.4
From " " " " " " " " 1927			4978	42.4	7.3 "	363	78.3
Number of lives (out of 4978) previously insured			3665	—	—	280	76.7
Number of lives (out of 4978) not previously insured			1313	—	—	83	84.5
Number of lives (out of 4978) approved for \$200,000			603	—	2.1 "	4	52.6

#### EXPERIENCE BY INSURANCE RECORD\*

Insurance Record	Approvals of 1898 to 1926, to policy anniversary in 1927					All Durations	No. of Lives			
	First 5 Years	After 5 Years	Act.	Exp.	Ratio					
A	57	80.7	70.6%	155	193.3	80.2%	212	274.0	77.4%	2,628
B	24	30.3	79.2	44	61.0	72.1	68	91.3	74.5	1,087
C	17	20.9	81.3	29	34.6	83.8	46	55.5	82.9	775
D	14	14.4	97.2	23	28.4	81.0	37	42.8	86.4	538
Total	112	146.3	76.6	251	317.3	79.1	363	463.6	78.3	4,978

\*A—Previous Insurance in Force; Full New Amount Delivered

B—Previous Insurance in Force; Full New Amount NOT Delivered

C—No Previous Insurance in Force; Full Amount Delivered

D—No Previous Insurance in Force; Less Than Full Amount Delivered

## EXPERIENCE BY AGE AT APPROVAL

## EXPERIENCE BY YEAR OF APPROVAL

Year of Approval	1888-1917	1888-1923	1894-1926	All years
Approval	61.7	67.2	8.0	11.2
95.6%	232	19	251	146.3
	286.3	31.0	317.3	76.6
	81.0%	61.3	79.1	
	291	64	363	
	348.0	98.2	463.6	
	83.6%	65.2	78.3	
	1,624	1,947	4,978	
	1,407	1,407		

An analysis of the causes of death shows no apparent increase in deaths from Cancer, Tuberculosis, Apoplexy, Organic disease of Heart, Pneumonia, Appendicitis or Nephritis, as compared with Deaths from all causes during recent years. Deaths from Angina Pectoris and Suicide are twice as high as the Company's general experience.

Dr. Daley—It has always been a mystery to me how such an unscientific method of treating toxic goitre as surgical operation could be so successful, but it appears to be so. A previous paper which was presented from the Northwestern on this subject by Dr. Harlow and also one by the Equitable tend to demonstrate that fact. Does anybody wish to make any remarks on the subject of goitre or the subject of \$1,000,000 risks?

If not, I am going to ask Dr. Carber of the Mutual Life to explain why he had to write a paper on glycosuria.

Dr. Carber—Mr. President and Gentlemen: This paper today is not really a statistical paper; it is essentially clinical. When we think of intermittent glycosuria, we are prone to consider it only in terms of diabetes or potential diabetes. Is there any other hazard? Dr. Bradshaw and I have undertaken this study with the idea of finding out what happens to these cases of intermittent glycosuria when we are satisfied that they do not have diabetes or do not feel that they are likely to have diabetes. That would include such cases as renal glycosuria, alimentary glycosuria and intermittent glycosuria, cause unknown.

We have taken as our material our issues for 1907 to 1924 exposed to 1927. These are cases that have had glycosuria found two or more times within five years. Our general experience has been very satisfactory when all policy years combined are considered, but when we divided them into groups by policy years, certain facts become apparent. In the first five policy years, that is, during the select period, our experience is better than the general mortality of all our issues for the same period, but from policy years six and over, we find an increase of 25 per cent and from policy years eleven and over, we find an increase of 52

per cent in excess of the general mortality of all the issues for the same period. In other words, we have a group in which it is necessary to constantly admit new blood in order to maintain a satisfactory general mortality. There is an increasing hazard in the later years.

When we obtain such an experience we naturally think of degenerative disease first; but diabetes is not a degenerative disease. Our conception of it is as a disease of metabolism. Pathologists do not mention in their descriptions evidences of cardio-vascular degeneration. It is a disease of the pancreas; but when we consider the disease from a clinical standpoint, there are some significant factors to note. Diabetes in a young person is an acute fulminating, malignant disease with rapid loss of weight and early termination by coma. Diabetes in people of middle age or in older ages is a mild chronic disease with very few clinical manifestations, which is very apt to be complicated by high blood pressure, apoplexy, angina pectoris, myocardial degeneration or cardiac manifestations of various kinds.

With this in mind, we took all our diabetic death claims for this same period, that is, the issues of 1907 to 1924 exposed to 1927. We had 522 of them and we found that 124 of these cases gave as a secondary or exciting cause of death some form of degenerative disease, angina, heart disease, apoplexy, etc. Now, if diabetics are apt to show degenerative disease, what about these cases of intermittent glycosuria, who have not diabetes.

We took our death claims in this group—we had over 300 of them—and we found that there was an amazing increase in the incidence of diabetes, about

seven times the general experience of all the issues for the same period. Of course, this is to be expected in a lesser degree. It may be our method of selection. We have to remember that in the earlier years, that is, 1907 to 1917, our methods were crude. At that time our only method for excluding diabetics was the examination of repeated casual specimens of urine. At a later time, the test meal was introduced and it is only in recent issues that scientific studies of blood chemistry have been employed. We also found in this group that our degenerative diseases, that is, myocardial diseases, angina, apoplexy, were nearly double the general experience for all the issues covering the same period. Now there is one thing which is also noticeable, and that is that the ages were not advanced. It is very hard to obtain standards for comparison. The average age at death in both these groups was young, that is, under 60, but it was for an exposure of only 20 years. The average age at death from degenerative diseases during the experience of more than 80 years is over 60, between 60 and 65. Our belief is that these people die at a younger age, but we can't prove it. It would involve a medicolegal investigation which would be very extensive and to which this paper makes no pretense.

We feel, then, that in considering cases of intermittent glycosuria, regarding their acceptability as life insurance risks, that we can look for a marked increase in the incidence of diabetes and we can also look for a marked increase in degenerative disease.

THE CLINICAL SIGNIFICANCE OF INTERMIT-  
TENT GLYCOSURIA FROM THE VIEW-  
POINT OF INSURANCE MEDICINE

By

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This paper is presented as a clinical study, with the object of obtaining information which may be of help to those of us who are interested in the application of individual selection to Insurance Medicine. It is in no sense a Medico-Actuarial study.

For some time we have known that all diabetics do not die of diabetes or its complications. It has long been recognized that many of them become arteriosclerotic and that their exit is due to cardiac or vascular or renal disease.

The impression seems to exist that these cardiac and vascular and renal deaths occur principally among elderly diabetics who have lived a normal life span, and are thus entitled to arteriosclerosis. This group runs a prolonged mild course which ends in death from

vascular complications and stands in marked contrast to the acute fulminating diabetes of young people which, before the discovery of insulin, rapidly developed acidosis and terminated in diabetic coma.

The modern theory of the pathology of the disease is based upon a morbid process in the Islands of Langerhans which prevents them from protecting the body against diabetes. The causes of this morbid process are given as necrosis, infection and malignant disease, but we have noted no mention of vascular degeneration.

With these impressions and theories in mind we wish to approach one of the most troublesome problems of Insurance Medicine; that is, non-diabetic and intermittent glycosuria. By excluding to our satisfaction all known diabetics, are we justified in assuming that there is no other hazard involved in the group which includes the so-called renal diabetes, alimentary glycosuria, and simple intermittent glycosuria?

We have therefore made studies of entrants from 1907 to 1924, exposed to 1925 showing sugar one or more times, on or within five years of examination, and of entrants from 1907 to 1924, exposed to 1927 showing sugar two or more times, on or within five years of examination. Sugar was never found more than once on our own examination, and subsequently two or more clear specimens were always obtained. Signed diet statements to the effect that there had been no dietary restrictions of any kind for one year were submitted in all cases.

To determine the incidence of cardiovascular deaths among diabetics we have studied in addition all our diabetic death claims for the period from 1907 to 1925.

TABLE A

TISSUES OF 1907 TO 1924=EXPOSED TO 1925

Policies terminated by death from diabetes as primary cause.

In 124 of 522 diabetic cases cardiovascular or renal disease was given by the attending physician as the immediate cause of death. The average age at death was only 58.3 years. Impairments at entrance of overweight (build groups 3, 4 and 5), hypertension, urine, or habits were not present in sufficient numbers to materially influence the results. This experience does not seem to indicate that vascular degeneration in diabetes is confined to the later decades of life. It practically coincides with the average age at death in our general experience of over eighty years. For the first six months of 1928 the death claims taken from our entire experience from all causes showed an average age of 57.7, for cancer alone 59.3, for apoplexy 64.5, diseases of the heart 63.1, diseases of the arteries 65.8 and diseases of the kidney 63.1.

Our experience with entrants who have shown sugar two or more times on or five years before admission is given as follows:

TABLE B  
 CASES WITH A HISTORY OF SUGAR IN TWO OR MORE SPECIMENS  
 Issues of 1907 to 1924, exposed to Anniversaries in 1927  
 Ratio of actual to expected based on the American Men Select Table  
 Summary by Ages at Entry, Policy Years One to Five

Ages at Entry	Entrants No.	Amount	Exposures No.	Amount	Terminated by Death		Ratio		General Experience Ratio	
					No.	%	No.	%	No.	%
15-19	6	\$ 31,000	20	\$ 133,000	—	—	—	—	—	—
20-29	137	526,100	568	2,068,400	2	2,000	93.5	25.6		
30-39	496	3,419,500	2,109	14,056,000	16	112,500	171.5	178.1		
40-49	459	3,758,700	1,967	15,920,800	4	19,000	28.3	16.5		
50-59	232	1,949,200	946	8,236,800	10	107,000	74.2	88.1		
60 & Ov.	48	614,000	200	2,586,000	2	15,000	30.5	18.9		
Under 40	639	3,976,600	2,697	16,506,400	18	114,500	156.1	160.2	86.8	89.8
40 & Over	739	6,321,900	3,113	26,743,600	16	141,000	46.8	44.7	74.2	76.5
Total	1,378	10,298,500	5,810	43,250,000	34	255,500	74.4	66.0	80.7	81.7
Policy Years Six & Over										
15-19	9	17,000	—	—	—	—	—	—	—	—
20-29	299	722,700	—	—	—	—	—	—	—	—
30-39	1,100	6,754,400	12	49,500	146.0	100.2				
40-49	1,025	7,061,800	14	112,000	95.2	113.9				
50-59	411	3,121,000	16	95,500	124.6	98.2				
60 & Ov.	46	1,077,000	1	20,000	32.7	30.3				
Under 40	1,408	7,494,100	12	49,500	124.4	93.7	83.9	91.5		
40 & Over	1,482	11,255,800	31	227,500	101.3	86.9	79.0	83.5		
Total	2,890	18,753,900	43	277,000	106.8	88.1	81.1	86.1		

TABLE B (continued)

Policy Years Eleven & Over						
15-19	3	6,000	—	—	—	—
20-29	45	92,500	—	—	—	—
30-39	285	1,642,000	7	28,500	241.4	175.4
40-49	229	1,320,500	2	37,000	43.6	145.0
50-59	107	660,000	9	42,500	192.3	150.5
60 & Ov.	12	380,000	—	—	—	—
Under 40	333	1,740,500	7	28,500	222.2	170.1
40 & Over	348	2,360,500	11	79,500	108.3	97.2
Total	681	4,101,000	18	108,000	135.2	109.6
All Policy Years Combined						
15-19	29	150,000	—	—	—	—
20-29	867	2,791,100	2	2,000	56.5	17.9
30-39	3,209	21,059,400	28	162,000	169.5	143.9
40-49	2,992	22,982,600	18	131,000	62.4	61.4
50-59	1,357	11,557,300	26	202,500	98.8	92.6
60 & Ov.	246	3,663,000	3	35,000	31.2	24.1
Under 40	4,105	24,000,500	30	164,000	141.6	132.0
40 & Over	4,695	38,003,400	47	368,500	72.6	63.8
Total	8,700	62,003,900	77	532,500	89.6	75.9
					80.9	83.7
					76.8	79.9

It is here shown that the satisfactory mortality of all policy years combined is due to the extremely favorable mortality of the first five policy years. Policy years six and over are 25%, and policy years eleven and over are 52% in excess of the Company's general mortality for the same period.

Since the above tabulated group did not supply us with adequate material for a study of the death claims (there being only 77) we have used the larger group of entrants showing one or more sugar findings in 5 years in which the mortality experience was satisfactory, and which of course includes all the claims of the group we have just recorded.

TABLE C  
Policies terminated by death from 16 principal causes among cases with a history of Sugar in the Urine in one or more specimens, compared with the General Experience of the same period.

Group	Cause of Death	Issues of 1907 to 1924, Exposed to Policy Anniversaries in 1925				General Experience												
		Death Rate Per 100,000	Average Age at Death No.	Builds 3, 4, 5 No.	% of total No.	Systolic Pressure No.	Total 151&Ov. No.	% Total 93&Ov. No.	Diastolic Pressure No.	Albumin without Casts No.	Albumin with Casts No.	Casts No.	Steady Albumin Users No.	General Death Rate Per 100,000	Average Age at Death No.			
1	Acute Infectious Diseases	56	130	45.6	1	1.8	36	—	20	6	30.0	14	25.0	2	3.6	119	39.3	
2	Septic Infectious Diseases	15	35	55.1	1	6.7	9	—	—	1	—	—	2	13.3	—	16	43.8	
3	Syphilis, Locomotor Ataxia and Paresis	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	46.1	
4	Tuberculosis	17	39	43.2	—	5	—	—	3	1	33.3	2	11.8	—	—	42	37.9	
5	Cancer	20	67	52.4	1	3.4	20	—	—	5	—	—	6	20.7	—	5	52.5	
6	Diabetes	22	53	55.1	4	18.2	10	—	—	5	—	—	8	36.4	—	1	43.3	
7	Other General Diseases	4	9	50.6	—	4	—	—	—	1	—	—	1	25.0	—	—	8	42.9
8	Apoplexy and Paralysis	20	46	49.9	—	6	—	—	2	—	—	5	25.0	—	—	36	55.6	
9	Insanity	6	14	41.0	—	—	—	—	—	—	—	—	—	—	—	3	46.7	
10	Cerebral Tumor and Disease of Ear	4	9	47.5	—	3	—	—	1	—	—	—	—	—	—	4	44.2	
11	Organic Heart Disease	38	88	54.5	1	2.6	32	—	20	6	30.0	9	23.7	—	3	7.9	42	54.9
12	Angina Pectoris and Disease of Arteries	21	49	58.4	—	—	18	—	—	7	—	—	5	23.8	—	2	9.5	55.9
13	Bright's Disease	15	35	52.4	1	6.7	6	—	—	4	—	—	4	26.7	—	—	—	52.2
14	All Other Diseases	17	39	44.7	1	5.9	10	—	—	4	—	—	5	20.4	—	3	17.6	45.3
15	Suicide	6	14	45.2	—	—	4	—	—	4	—	—	1	16.7	—	1	16.7	20
16	All Accidents	41	95	44.7	4	9.8	28	—	—	23	—	—	3	7.3	—	—	58	37.1
Total from All Causes		311	721	49.4	14	4.5	191	—	—	96	13	13.5	65	20.9	—	3 1.0	19 6.1	526 45.4

It is here shown that the death rate from diabetes is enormously increased. Perhaps our methods of selection may have been to some degree responsible.

For the first ten or twelve years practically all of the cases in Table C were selected by the method of obtaining three casual normal specimens after a positive sugar finding either by ourselves or by some other Company. It is only during the last five to eight years that we have required two normal specimens collected two hours after lunch or dinner composed of a menu, the details of which are submitted and must show satisfactory carbohydrate intake. In some of the latest cases with the most suspicious urinary records, we required the submission of a blood sugar curve showing normal carbohydrate tolerance.

It is to be regretted that these more modern methods of exclusion of diabetics at entrance have not been in use long enough to supply sufficient material for a special study; no doubt our future experience will show material improvement in the incidence of diabetic deaths in this group, but it is our impression that no method of exclusion will be adequate to reduce the diabetic death rate to that of the general experience.

The favorable experience in tuberculosis is worthy of note, as it does not bear out our earlier teachings.

The incidence of septic infection is markedly increased; an experience which seems clinically significant.

The death rates from organic heart disease and angina pectoris are markedly increased and there is no discrepancy of average age at death to explain it.

There is a decided increase in the death from apoplexy at an average age, more than five years younger than the general experience for the same period.

The cancer rate is also greatly increased at about the same average age.

Impairments at entrance of habits, build, blood pressure and urine (with the possible exception of albuminuria), are not recorded with sufficient frequency to materially affect the results.

It is not the purpose of this paper to draw definite conclusions. Further actuarial studies would be necessary in this event, but we feel that there is clinical significance in the material here presented, which should be of value from the standpoint of Insurance Medicine.

Dr. Daley—This paper of Dr. Bradshaw and Dr. Carber comes at a very opportune moment. So many of the Companies are showing a tendency to insure these intermittent glycosurias at regular rates if they show a good blood sugar. I think that we should go very carefully or we are going to have an increased mortality in this class of applicants.

Now, gentlemen, we have some little time left before adjourning for luncheon and we will not go further with our sugar program this morning.

If there is nothing else before this meeting, we will adjourn for lunch, which will be here in the foyer. We will reassemble here at 2:00 o'clock.

## AFTERNOON SESSION

Dr. Daley—Notwithstanding the discovery of insulin by Banting and its application as a reliable aid in the therapy of diabetes, the mortality from this disease is still increasing. Reports of the Department of Health of New York City show that the deaths from diabetes and quinquennial rates per 100,000 of population in New York City were—

		Rate
For the quinquennium, 1898 to 1902, incl.	395	11.4
“ “ “ 1913 to 1917, “	1049	20.9
“ “ “ 1923 to 1927, “	1359	23.1

Dr. Haven Emerson in an article pointed out the incidence of diabetes among those who use their finer muscles, smaller muscles, the needle trades, for instance. New York City has a large population who do this work, so possibly these figures will not be borne out quite so much in the country at large, but they show what is happening here.

We are now to hear the discussion of several excellent papers on glycosuria, but we must remember that glycosuria is only a symptom of diabetes and we do not know the mortality rate among the so-called “renal diabetics.”

I would like to read extracts from Dr. Joslin's present-day diabetic creed:

“For my own practical guidance in 1923, I adopted a diabetic creed, but, like the best of creeds, it has undergone alterations, and I am sure will soon require more. I believe in the beginning of this year 1928:

“That diabetes mellitus should be considered so prob-

able in any person who has 0.1% or more of sugar in the urine that he should be watched for life.

"That diabetes of itself is not fatal, but that death ensues from other diseases or complications. (The paper of Dr. Carber and Dr. Bradshaw tends to show that.)

"That the diabetic should be regarded as unusually susceptible to arteriosclerosis and should be treated with this in view.

"That any patient with a tolerance of less than 100 grams of carbohydrate should (a) test his own urine for sugar, (b) keep sugar free, and (c) take home food scales and use them until he can keep sugar free without them."

It may be a little extreme to us, but this is the opinion of a man who has addressed this Association on that subject and who we all know is an authority.

I would like to give the death claims from diabetes of the Equitable Life Assurance Society for the year 1927. The Equitable had 10,224 death claims for all reasons in 1927. Of these, 161 were due to diabetes. The first year death claims were 477. Of these but two were due to diabetes.

Now, in relation to disability, the Equitable paid 1,697 disability claims for the first nine months of 1928. Of these but five were due to diabetes. There were 382 first year claims, and only one was due to diabetes.

I am now going to ask Dr. Streight to make a few remarks. We do not expect Dr. Streight to read his paper, but we would like to have him make a few remarks. Dr. Streight.

Dr. Streight—Dr. Daley and Gentlemen: In the paper which I have presented to the Association, I have endeavored to review the literature on the subject of low threshold glycosuria. Like all the rest of

you, I have been searching for daylight and one finds very conflicting opinions among the blood chemists who are doing a good deal of this work. The various articles which have been reviewed and one or two later ones which I did not include in the paper show you how different the opinions may be among different workers. One finds that difference much more markedly when you come to study the reports made by these different individuals and received in your office upon which to make a decision.

I have reports coming in where the peak has been as high as 250 milligrams per 100 cc. of blood. This returns to a level of, say, 165 in two hours and back to probably 110 or thereabouts in two and a half to three hours. These are labeled definitely as low threshold cases. With this opinion from the insurance angle I cannot agree. It does not seem to me possible that an individual who does not leak any sugar until the blood sugar content has raised to 180 or 200 milligrams of sugar can be regarded as suffering from a low renal threshold. I think that those cases require to be considered with extreme caution and if we are going to insure them, we must certainly regard them as definitely under average lives. I think if we proceed to accept those readings as given to us by the laboratory workers and regard them as low threshold, then we may look for an increased mortality among those people, a very definitely increased mortality.

I think at this moment, sir, I have nothing further to add and will give the paper up for discussion.  
(Applause.)

## THE STUDY OF LOW THRESHOLD AND OTHER NON-DIABETIC TYPES OF GLYCOSURIA IN APPLICANTS FOR LIFE ASSURANCE

S. J. STREIGHT, M. D.

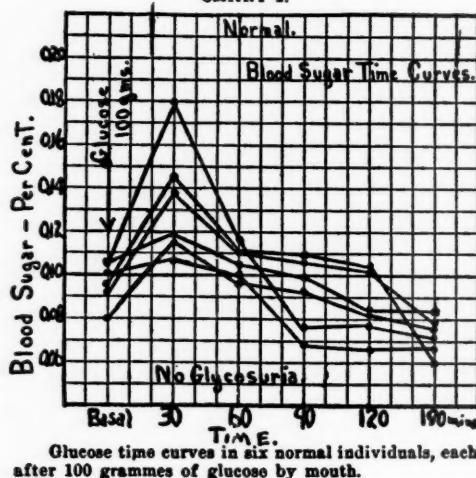
*Assistant Medical Director, Canada Life Assurance  
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Many contributions have been presented to this Association relating to the selection for assurance of that class of lives with a history, or the finding upon examination, of sugar in the urine in more than a normal amount. The present contribution is not a statistical study, nor does it bring to light any new scientific data. It is merely an attempt to present a review of the more commonly accepted opinions of investigators in this field. If selection is to keep pace with clinical and laboratory investigation in the field of medicine, we must endeavor to employ, where practicable, the methods of study developed more recently, so that our experience may be based upon accurate and scientific observation.

Let us first discuss the normal subject, and the effect upon his blood sugar concentration of a generous carbohydrate meal or of 100 gms. of glucose. Most authorities agree that in the average healthy individual the concentration usually rises from a basal figure of approximately .09% to 0.1% to a maximum of 0.16% to 0.18%, this maximum being obtained

in from thirty to sixty minutes after the ingestion of the glucose or meal. Where a meal is employed, fats should be allowed sparingly, as they retard digestion (2, 13). Slight variations in this may occur due to absorption and other factors, but generally speaking, the highest concentrations should be within the above limits of time. The urine should remain sugar free throughout. A normal response to 100 gms. of glucose is approximately 90, 130, 120, 90, 60, 85 mgms. at 0,  $\frac{1}{2}$ , 1, 2, 3, 4 hours respectively (1, 2, 3, 4, and 12).

CHART I.



It would appear that the amount of glucose ingested does not materially affect the height of the curve, but may retard the return to normal slightly. Several investigators report that nearly all their normal subjects tolerated 200 gms. and over of glucose

without glycosuria, and that the blood sugar returned to normal in  $2\frac{1}{2}$  hours or less (2, 3, 5, 16).

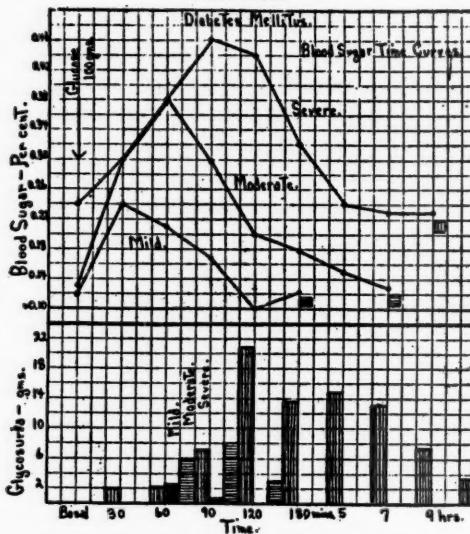
The rate of return to normal at first is rapid and then slower. It requires about the same time to fall which it did to rise, and in the average healthy individual the concentration is equal to or below the fasting level in from  $1\frac{1}{2}$  to  $2\frac{1}{2}$  hours. In old subjects the return to normal may take three hours, but even this delay should be regarded with some suspicion (2).

Glycosuria may result from a low kidney threshold which, it is generally believed, is a benign condition, or as a result of some disturbance of the regulating mechanism, which may mean much from the standpoint of life expectancy.

With reference to the blood sugar regulating mechanism, Mason (10) states: "The level of sugar in the blood is determined by the balance between those forces which are tending to elevate it and those which are tending to lower it. Absorption and conversion of glycogen into glucose (glycogenolysis) are pitted against oxidation and storage as glycogen. Hyperglycaemia with glycosuria may be produced by any of the following states:

- "1. A defective oxidation of glucose by the tissues;
- "2. Defective conversion of glucose to glycogen (storage);
- "3. An excessive rate of absorption (where storage and oxidation cannot compete);
- "4. Abnormally rapid conversion of glycogen to glucose (usually through stimulation of the sympathetic nerve supply to the liver)" (10).

CHART II.



Glucose time curves in three cases of diabetes mellitus of different degrees of severity. Each curve followed 100 grammes of glucose by mouth.

Let us presume, for the purpose of this discussion, that the possibility of the glycosuria being other than glucose has been eliminated, and that the possibility of the finding being accidental or due to some other clinical condition has been excluded. We then come to a class of applicants with a condition of recurrent glycosuria which may be of little significance or which, on the contrary, may be a very serious impairment. It, therefore, becomes necessary to differentiate within this group by means of studying the response of the individual's blood sugar regulating mechanism to a stated load (100 gms. of glucose, or a stated meal, following a fast

of at least five to six hours). This study should be made by a competent blood chemist, and, if possible, just prior to, and at the one-half, one, two, and three hour periods after, the above load. The urine should be studied for the percentage output of sugar and the presence of acetone or diacetic acid at the same periods.

The earliest, and probably the only definite indication of the presence of diabetes is glycosuria, and the presence of this sign cannot be stressed too greatly. No individual should be regarded as having an alimentary or renal glycosuria until proven so by all modern laboratory facilities available as well as by clinical study.

Early diagnosis of Diabetes is important since, of those deaths due to the disease, most occur in the early years of their diabetic life. The great majority of diabetics who have had the disease for a long time die of complications rather than of the disease itself (18 and 19).

In a recent address, Sir Archibald Garrod stated: "There are a few maladies, the diagnosis of which rests upon chemical evidence, or in which a derangement of the chemical processes is usually the earliest sign. This is often the case with diabetes, which is not infrequently first detected on examination of the patient for life insurance, and the earlier the recognition of the malady the better is the prospect of treatment" (17).

Since it is possible to obtain reliable determinations in practically all of our cities and towns, I would like to emphasize the wisdom of obtaining such studies in all cases of definite glycosuria. If this practice be followed, there will be available shortly material

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from which a valuable mortality experience may be obtained. Improved methods of blood sugar determination during the past ten years have very materially increased our knowledge of the changes which the blood sugar undergoes, both in health and in disease.

One of the difficulties in obtaining a Blood Sugar Determination in applicants for life assurance has been the necessity for puncturing a vein in order to obtain the necessary amount of blood. McLean (2) describes a method which he has employed since 1915, in which only .2 cc. of blood are required. This is obtained by a prick of the finger or ear as for an ordinary blood count. In the Boston Medical and Surgical Journal of 1926, Hazel Hunt describes a method employed in the New England Deaconess Hospital (20). Folin has recently described his method in the Journal of Biological Chemistry (15). If this method can be employed satisfactorily (and I believe it has been used by at least one company for some time), it may lessen the difficulties with which companies have to contend in obtaining complete blood sugar studies.

In low threshold or renal glycosuria it has been established that the kidney threshold for glucose is lower than normal. Consequently the usual rise in blood sugar, following a normal meal, produces a glycosuria. Investigators appear to be agreed that 0.14% or 0.15% of blood sugar is the peak concentration in this class.

In renal or low threshold glycosuria, we should have—

- (a) A glycosuria without hyperglycaemia;

(b) Little, if any, relationship between carbohydrate intake and the amount of glucose excreted in the urine. Total sugar excreted in twenty-four hours is small, rarely in excess of 20 grams daily (8).

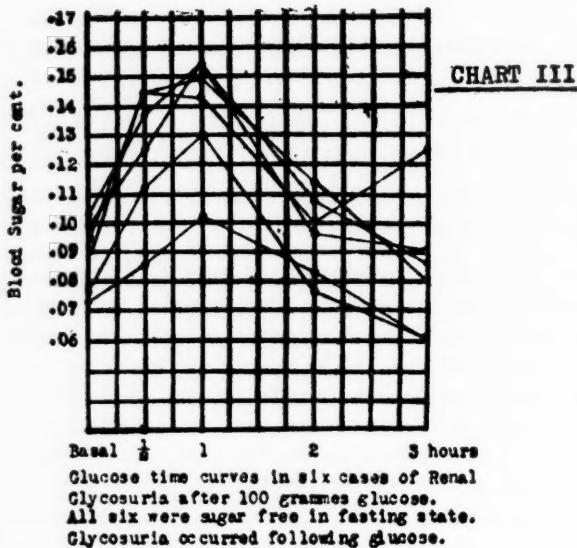
(c) An absence of the signs and symptoms of diabetes mellitus;

(d) A long period of observation during which the patient shows no tendency to develop diabetes mellitus;

(e) Respiratory Quotient after 100 grams glucose which rises as in normal individuals (6, 7, 8, 9, 10).

Each of the six applicants (Chart III), in the post absorptive state, fourteen hours after the evening meal, received one hundred grams of glucose in 250 cc. of water flavoured with lemon. Blood and urine sugar estimations were made before the administration of the glucose, and at  $\frac{1}{2}$ , 1, 2, and 3 hours following. The fasting urine was sugar free in each case. Glycosuria appeared in varying amounts at  $\frac{1}{2}$  to one hour after the glucose, and all were sugar free at the three hour test.

The generally accepted normal threshold was not reached in any of these six cases, and all blood sugars returned to their original levels in from two to  $2\frac{1}{2}$  hours. The response of renal diabetes to 100 grams of glucose is practically that of a normal individual, the chief difference being that glycosuria is present most of the time.



When the resulting curve conforms to the definite low threshold type (Chart III above), the problem of assessing the life is moderately clear. When, however, we obtain reports showing a marked departure from this type (see Chart IV), indicating impaired carbohydrate metabolism, but classified by recognized authorities as being a harmless glycosuria, I believe we must, for the present, accept their opinions with some caution.

## CHART IV

	Blood-Sugar Urine			Blood Sugar Urine	
Fasting	0.096%	None	Fasting	.112	Neg.
½ hr. after ingestion	0.150	0	½ hr. after ingestion	.208	
1 "	0.217	.5%	1 "	.176	.3%
2 "	0.164	.5%	2 "	.145	.5%
3 "	0.094	Trace	3 "	.085	Neg.

In the past the general trend of opinion was to regard every case of glycosuria as diabetes. Investigation, carried out by numerous workers and covering a large series of cases, has shown this view to be erroneous. As a result of the work carried out by investigators in this field, we know that many of these cases of glycosuria are of a benign character. There is, however, a possible danger that, as a result of the favorable findings in many cases, companies may be led to accept some of these lives for assurance without having made a sufficiently thorough study of the condition to determine the classification to which they belong. It is a wise precaution to regard every case of definite glycosuria as being a possible diabetic until it has been proved by careful investigation to be otherwise.

There is some difference of opinion among investigators in this field as to whether the peak to which the blood sugar rises or the rapidity with which the normal level is reached, following a load of 100 gms. of glucose, is the more important. It would seem safe to assume that each factor should be given due consideration in order that we may, as a result of our study, obtain material which will contain sufficient data for any future mortality investigation along this line.

The following tests are the result of Blood Sugar

Determinations carried out in applicants between the ages thirty and fifty, all being of average build and family history, and glycosuria being the only impairment found. Although the curves returned to the fasting level within the two-hour period, we can scarcely regard them as being low threshold in type; nor can we regard them as being normal individuals when applicants for life assurance. They may be perfectly healthy and, for the present, not in need of any treatment or observation, save a periodic recheck.

#### CHART V.

Specific Gravity 1003. Sugar found on examination.  
Blood Sugar Curve:

Fasting	0.125%	Urine
1 hr. after glucose	0.219%	Specimen 1 Before test dose of glucose.
1 1/2 hrs. "	0.125%	
2 hrs. "	0.07 %	Sugar content=3.33 grms. per litre
2 1/2 hrs. "	0.055%	Specimen 2 2 hrs. after test dose of glucose.
		Sugar content=8.33 grms. per litre

Recheck of this test two days later  
confirmed the above.

Fasting	.123%	Urine
1/2 hr. after glucose	.221%	0.5%
3/4 hr. "	.226%	0.45% in 180 cc.=0.81
1 hr. "	.181%	gram.
2 hrs. "	.100%	0.125% Acetone=Nil Diacetic=Nil

24 hour specimen, 1,577 c.c.'s voided. Specific gravity 1,015, no Sugar.

Fasting	9:30 a. m.	Blood Sugar	0.137%
	10:30 a. m.	"	0.262% History of glycosuria
	11:30 a. m.	"	0.114% since 1917
	12:30 a. m.	"	0.110%

	Blood	Urine	
Fasting	.126	Neg.	
1/2 hr.	.224	+++	Comment:
1 hr.	.177	+++	Non-diabetic
2 hr.	.094	+++	
3 hr.	.089	++	

It has not been proven that cases of definite renal diabetes progress into diabetes mellitus. It is just possible, however, that a proportion of those individuals, whose Blood Sugar rises above .180% before showing sugar in the urine, but who return to fasting level in 2 to 3 hours, may later develop into diabetics. Petty and Stoner (11) state: "A number of cases, whose Blood Sugar rose above 180 mg. per 100 cc. blood and returned to normal in less than three hours, were shown by respiratory quotient curves, to be definitely diabetic."

The finding of glycosuria may have little or no significance. On the other hand, it may be the first indication of a very serious condition. We feel that wherever there is a history of glycosuria, or where it is found at the time of examination, the case should be thoroughly investigated from every angle. Even where it is finally proven that the applicant belongs to the "low threshold" or "renal diabetic" group, we feel that there is some departure from the normal, and to meet this we have employed a debit basic rating of plus 20. Should the applicant be free from any other impairment, this will enable the case to be issued on a standard basis. Should, however, there be any accompanying unfavorable feature such as family history, overweight, or any other physical impairments, we feel that the combination probably places the life in a substandard class.

With regard to the ordinary glucose tolerance test, where the urine only is examined following a fixed carbohydrate meal or 100 gms. glucose, the following case will illustrate the possible danger in accepting risks following this test. Application in May, 1925; owing to the fact that we were unable to obtain a blood

sugar tolerance test, a glucose tolerance test (urinary, using 100 grams of glucose in lemonade) was accepted.

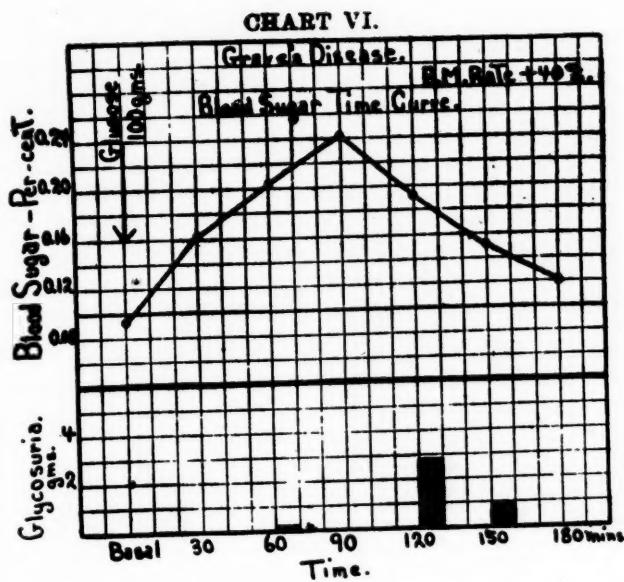
Specimen before glucose, 1020, no sugar in urine.  
One hr. after 100 gms., 1026, .4% sugar in urine.  
Four hrs. after 100 gms., 1019, .4% sugar in urine.

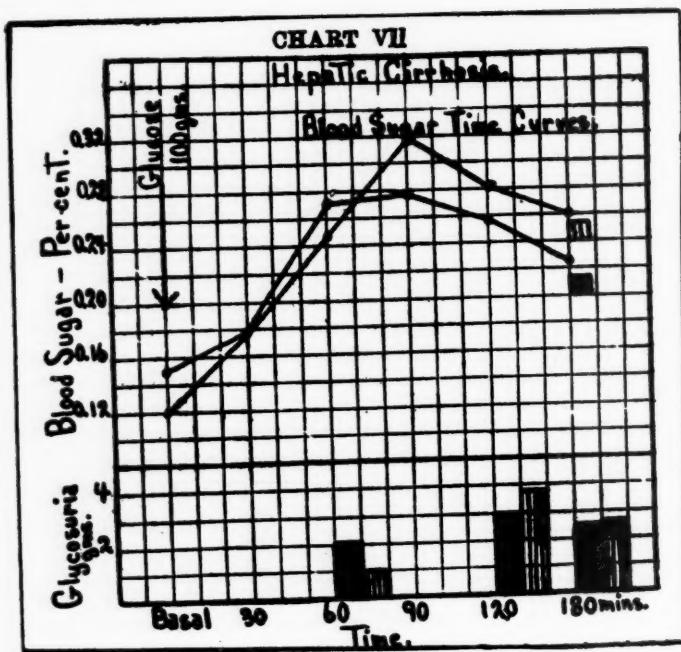
In May, 1928, a study of the blood sugar was made with the following results:

Fasting .....	.129%	Urine sugar free
½ hr. after 100 grams glucose	.192%	Urine positive
1 hr. " " " "	.312%	Urine positive
2 hrs. " " " "	.164%	Urine positive
3 hrs. " " " "	.100%	Trace of sugar in urine

This work was carried out by a well known blood chemist, who states, "I believe that a curve such as the one obtained above is definite evidence of diabetes, provided one has eliminated, by clinical examination, other causes such as hyperthyroidism, chronic nephritis, etc." This curve also illustrates the risk of depending upon a single Blood Sugar Estimation taken at 2½ to 3 hours after the glucose.

Anamolous types of curve are sometimes found in which the Blood Sugar rises rapidly, exceeds the threshold, at which time glycosuria occurs, and after a slight delay returns to normal, or even below in two hours. This person is not a low threshold type nor necessarily a diabetic, but to establish the class to which he belongs is often difficult, sometimes impossible. It is found in some normals and in many diseases. From the standpoint of underwriting, these individuals should be carefully studied for other clinical conditions (hyperthyroidism, gastric or duodenal ulcer, hepatic cirrhosis, toxic conditions, etc.) Charts VI and VII.





Since it is not always possible to make an exhaustive study of applicants for life assurance, of necessity we are forced to adopt some practical working basis for Blood Sugar studies, and in our Company, we have decided upon the scheme outlined in Chart VIII. We endeavor to obtain a report showing the effect upon the blood as well as the urine after a fasting period of at least five hours, and at one and two hour intervals after the ingestion of 100 grams of glucose. We also require that the urine be tested for the presence of acetone at each observation. Our representative is advised that, on account of the finding or history of glycosuria, we are unable to consider the risk on the information before us. We further advise him that, if his prospect is sufficiently interested to submit to us a study of his blood sugar and urine, completed by a competent blood chemist in accordance with Chart VIII, same to be at his own expense, we will, after a study of such report, be in a position to advise him whether or not his prospect belongs to a group which we can assure.

## CHART VIII.

	Blood O'Clock	Sugar %	Urine Amt. in c. c.	% of Glucose	Acetone (Rothera Test)
Fasting at least 5 hours					
1 hr. after 100 grams of glu- cose					
2 hrs. after 100 grams of glu- cose					

During the past three years we have issued approximately \$1,000,000 of assurance based upon a complete blood sugar study. About 40% of this assurance, by amounts, was issued standard, and 60% sub-standard; by lives, the numbers were about equal. The "Not Taken" ratio was somewhat higher in the rated lives, while the lapse ratio was slightly higher among those lives who were issued standard contracts. Had we not been able to obtain Blood Sugar studies, very little of this business would have been issued. We feel, therefore, that the effort involved in obtaining a complete study of these lives was worthwhile, particularly as, up to the present, no deaths have occurred. We realize that this exposure is too small to warrant any conclusion being made. However, it may serve as some indication of what we may hope to obtain where acceptance is based upon complete blood sugar study.

It must not be overlooked that glycosuria, especially when of a transient nature, is found with much greater frequency than is generally realized. Examination of seven thousand consecutive specimens at our Home Office showed glycosuria in 367. The amount varied from .2% to 6%. Of this number, 173 contained .3% or over. A further study showed 64 to be accidental or due to other conditions. Of these remaining, blood sugar determinations were carried out where possible, with the result that we were able to offer contracts to the great majority of the group.

Faber (3) quotes Holst to the effect that on examination of 163 cases of glycosuria in applicants for life assurance, he found 49, or 30%, to be true diabetics.

The Metropolitan Life, in their Statistical Bulletin

for January, 1928, show a steady increase in the death rate from Diabetes in their industrial premium paying business from 13.3 per hundred thousand in 1911 to 17. per hundred thousand in 1927.

Joslin (19) states, "To discover diabetes we must seek for it where it is overwhelmingly common; this is in the obese, between ages forty-five and fifty-five." This being the case, we should be especially guarded in our selection of such lives when glycosuria is discovered.

The increased consumption of sugar, sweets and carbohydrate may be a factor in the apparent increase in glycosuria and diabetes.

#### SUMMARY

I. Glycosuria should never be regarded lightly, and, for the sake of the applicant, it should be remembered that glycosuria does not constitute diabetes. It should, however, be regarded as a danger signal, and all the methods now at our disposal should be employed to determine the cause.

II. Even among patients who are undoubtedly diabetics, there is a tremendous variety in the progress of the different cases. Some, even without treatment, remain almost stationary for years. Others progress rapidly to a fatal termination, and it is this latter group (when recognized in the early stages as a result of the finding of glycosuria during a life assurance examination, followed by a blood sugar study) which may, as a result of our study, be given the opportunity to obtain such supervision and regulation as to hold the condition under control and delay its further progress.

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III. Low threshold glycosuria is frequently a familiar characteristic.

IV. Low kidney threshold for sugar is evidently a constitutional abnormality, not necessarily a sign of any metabolic disturbance (3).

V. We must emphasize the point that two essentially different forms of glycosuria occur; one due to disease of the Islands of Langerhans, true diabetes, the other resulting from a deficient blood sugar regulation, which is dependent upon either an habitual abnormally low threshold or on an habitually high alimentary blood sugar rise (3).

VI. When glycosuria is discovered, where there is an alimentary rise to abnormal heights, particularly if the fasting level is above normal, or if the return to fasting level is delayed, extreme caution should be exercised in order to determine the true type.

VII. When glycosuria is discovered, a study of the fasting blood sugar, before any change in diet occurs, will yield valuable information.

VIII. It would appear that clinicians and blood chemists are, in the main, of the opinion that glycosuria, occurring in cases of proven low kidney threshold (where blood sugar does not exceed .16% following 100 grams glucose and returns to the normal fasting level in 2 to 2½ hours) is not a serious impairment; and where no other impairment exists, such lives may be regarded as normal. I believe this class may be regarded favorably for life assurance.

IX. When glycosuria does not occur until the concentration of sugar in the blood rises to .18% or higher, it is possible some pathological condition may

exist, and such blood sugar curves should be considered with due caution. This is particularly applicable where there is any delay in the return to the normal fasting level, or where the fasting level is high.

X. When glycosuria is discovered, companies will be well advised to insist upon a complete blood sugar study. When the result is favorable, the applicant benefits by increased peace of mind plus insurance issued. Should the study prove unfavorable, we are then in a position to advise him that a serious impairment exists and that he would be well advised to consult his physician. In this we are performing a very definite public health service.

XI. Several investigators in this field have pointed out that "it is clinically dangerous to make a diagnosis of renal glycosuria until the patient has been under observation for some years." How far, then, should we proceed in considering these applicants to be proven low threshold types as a result of one blood sugar determination?

XII. I am quite aware that many of the problems which arise have not been completely reviewed. It is hoped, however, that the discussion of this subject may elucidate some of the difficulties encountered in the assessment of those lives which a blood sugar study places just beyond the low threshold class (Chart V).

XIII. I believe that a useful purpose may be served by a consideration of the problem of a uniform blood sugar study in all applicants with glycosuria.

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- (3) Faber, Knud, Herter Lecture, Journal Clinical Investigation, Feb., 1926.
- (4) Rabinowitch, I. M., "Blood Sugar Time Curves," Journal of Clinical Investigation, Vol. II, #6, Aug., 1926.
- (5) Taylor and Hutton, Dept. Chemistry, U. of Pennsylvania.
- (6) Lewis, D. S., Archives Int. Medicine, 29. 418. Apr., 1922.
- (7) Paullin, James G., M. D., Glucose Utilization in Renal Glycosuria, Archives Int. Medicine, Vol. 37, 1926, page 88.
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- (9) Finley & Rabinowitch, Renal Glycosuria, Quarterly Journal of Med., Vol. 17, #67, 1924.
- (10) Mason, E. H., The Use & Interpretation of Blood Chemistry by the General Practitioner, Canadian Med. Journal, Vol. 18, No. 1, Jan., 1928.
- (11) Petty, O. H. & W. H. Stoner, Respiratory Quotient Curves in Diagnosis of Diabetes, Am. Journal of Medical Sciences, Vol. 171, June, 1924.
- (12) John, Henry J., Cleveland Clinic, The Relationship of Blood Sugar Content to Kidney Permea-

bility & Glycosuria, Journal of Lab. & Clin. Med., 9-626-1924.

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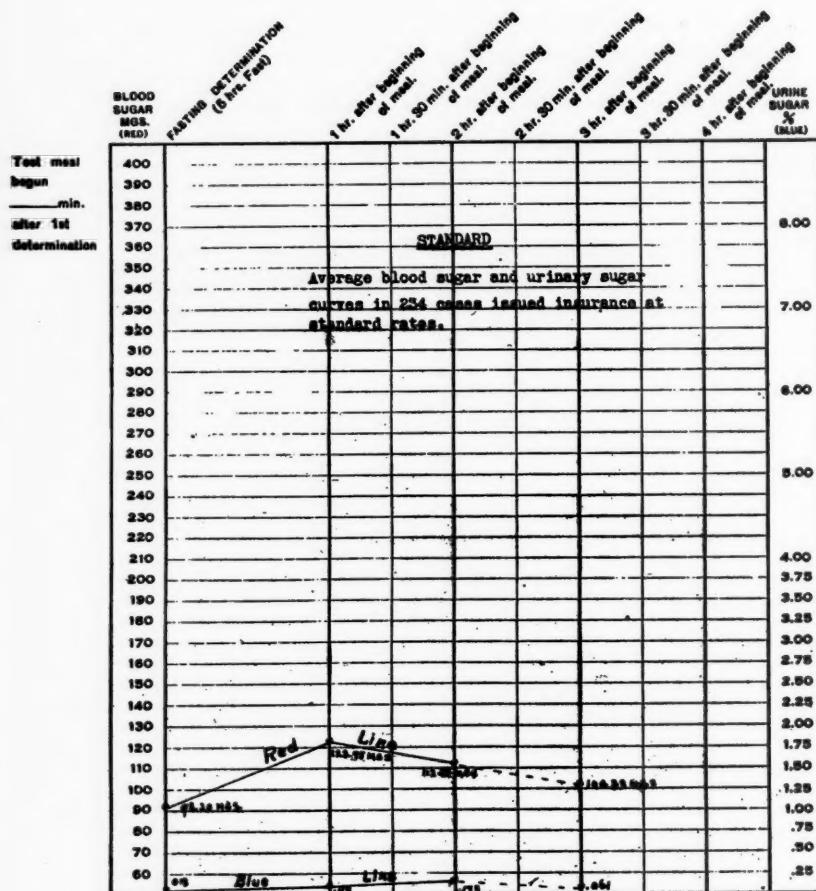
(18) Rabinowitch, I. M., Address on Diabetes, Canadian Med. Journal, 1926, XVI.

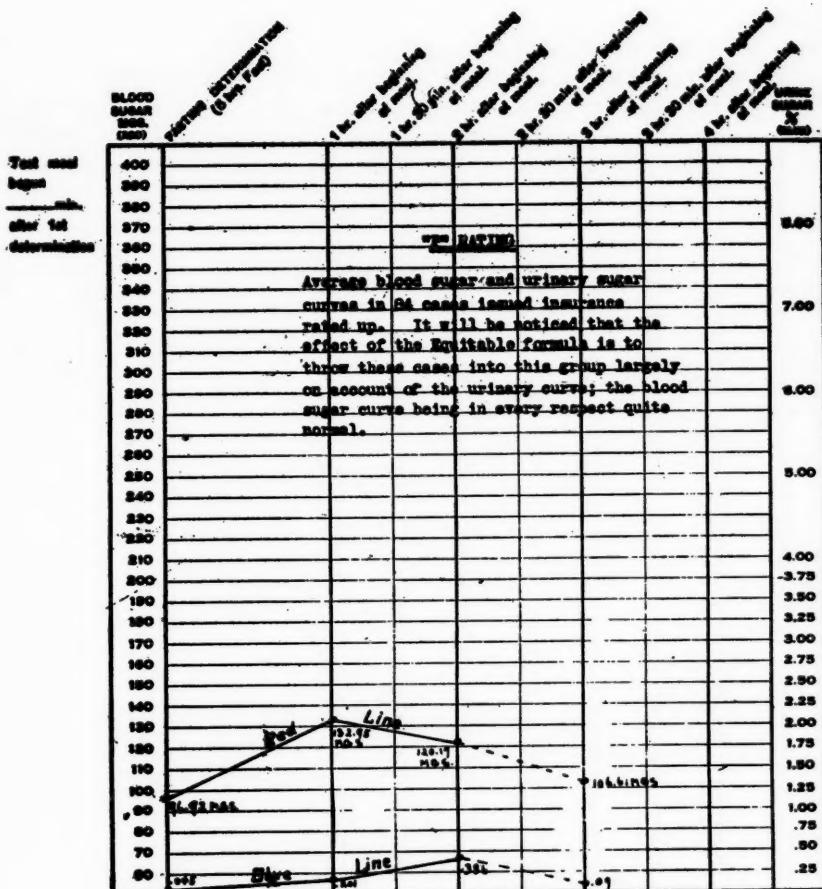
(19) Joslin, Ten Year Diabetic, Am. Journal of Medical Sciences, Apr., 1928, #673.

(20) Hunt, Hazel, "The Estimation of Sugar in Urine & Blood in the Doctor's Office," Boston Med. & Surgical Journal, Sept. 2/26.

(21) John, Henry J., "Diabetes, a Statistical Study of Two Thousand Cases," Archives of Internal Medicine, Aug. 1928, Vol. 42, pp. 217-247.

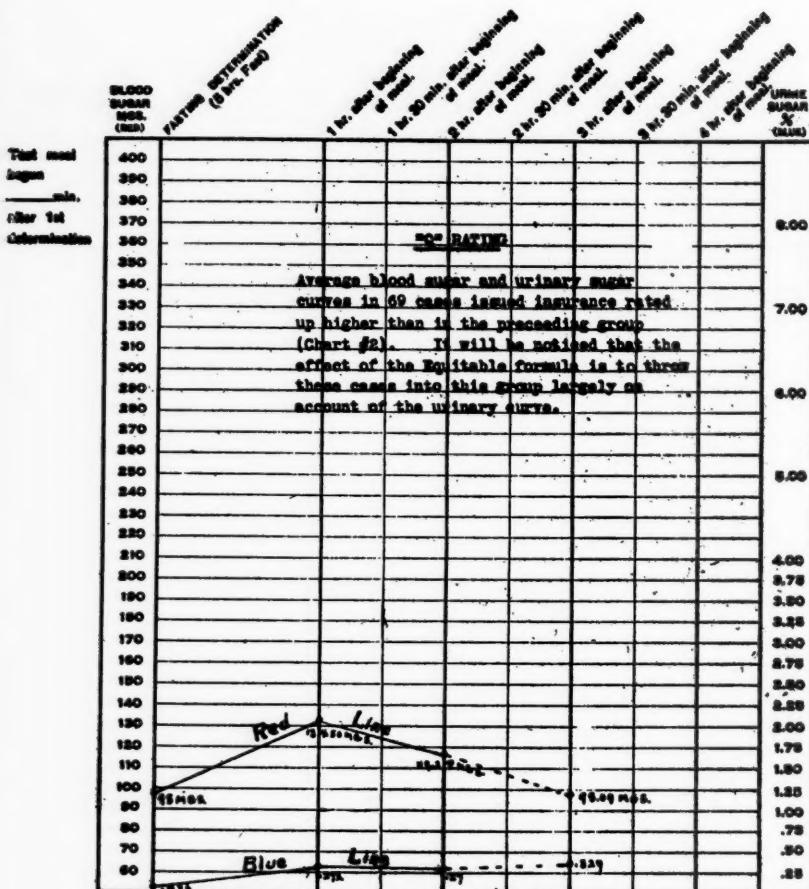
Dr. Daley—Dr. Brathwaite has prepared some charts showing the result of something over 1,000 blood sugar analyses with concurrent analysis of the urine.

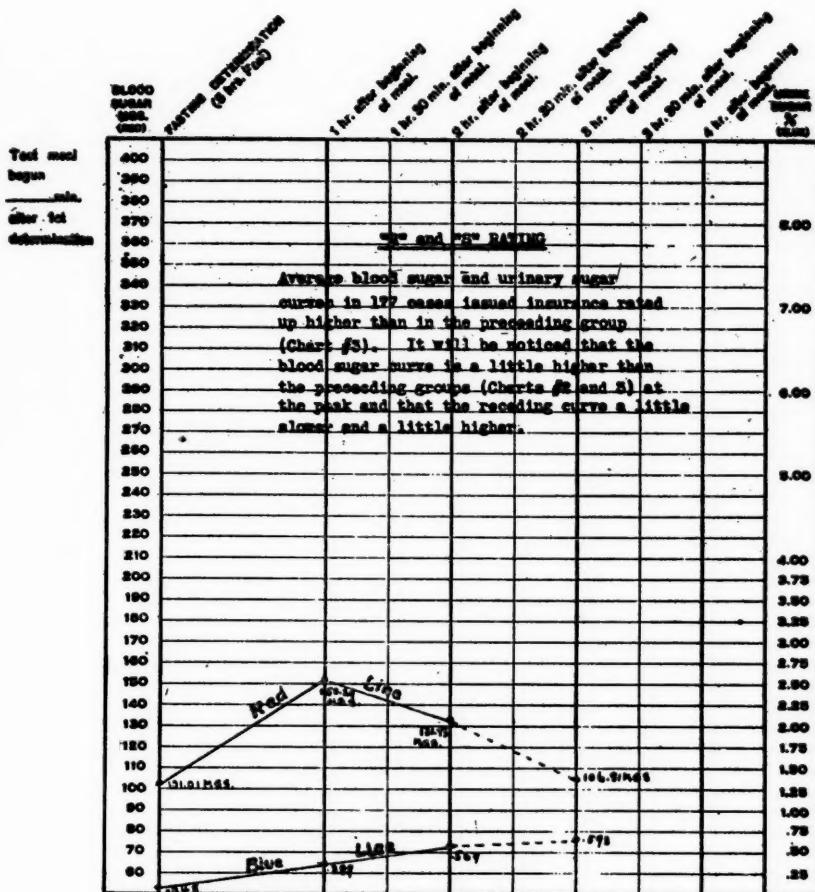




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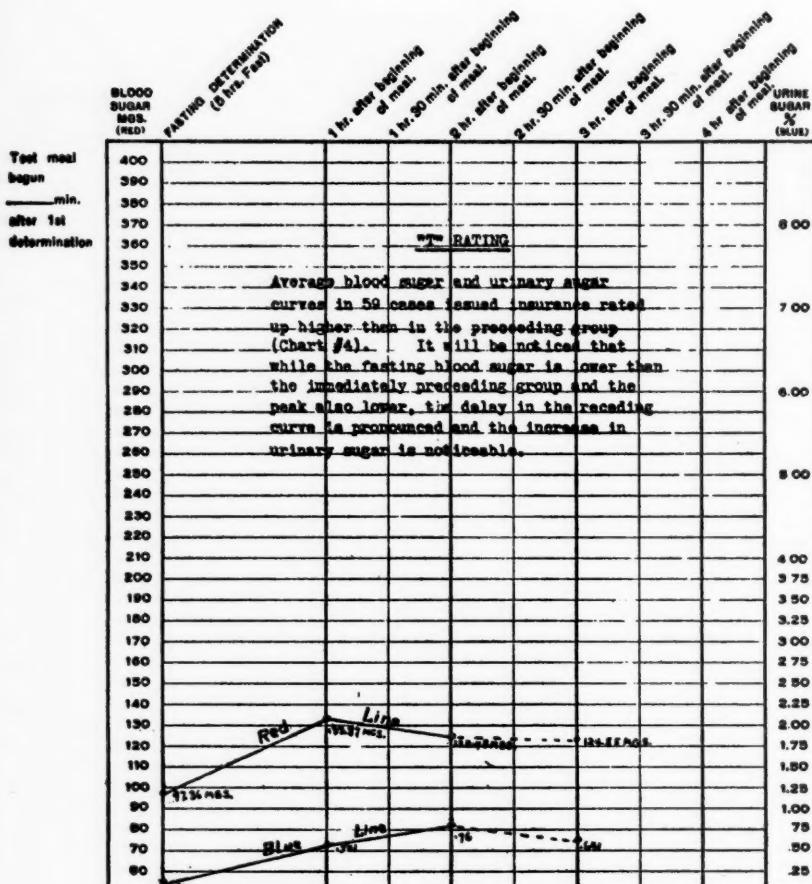
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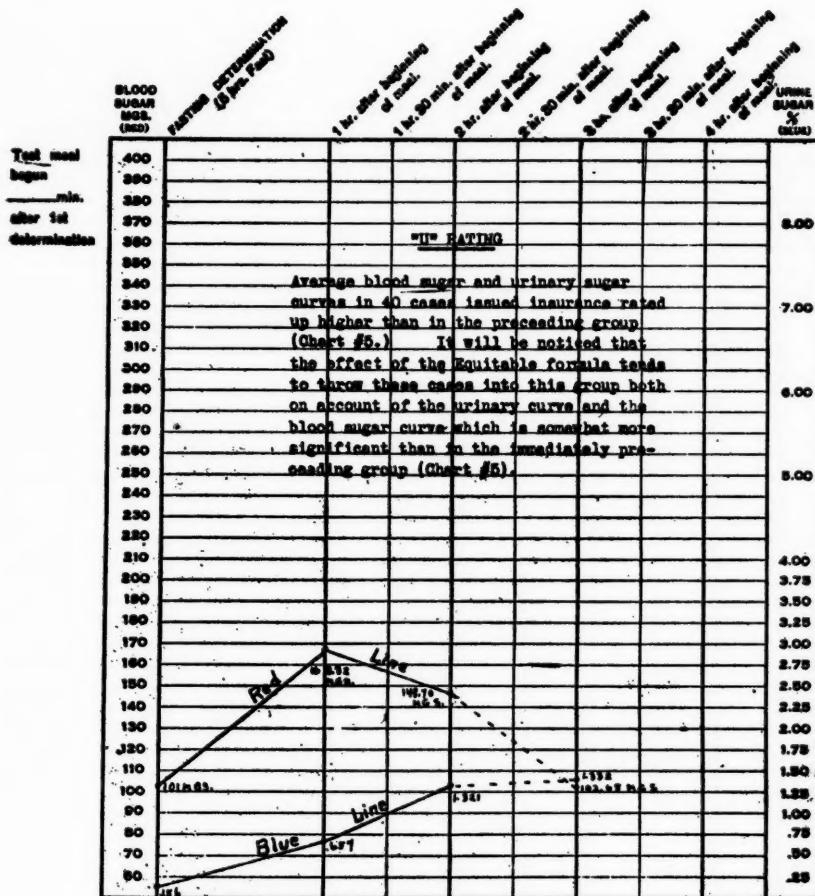
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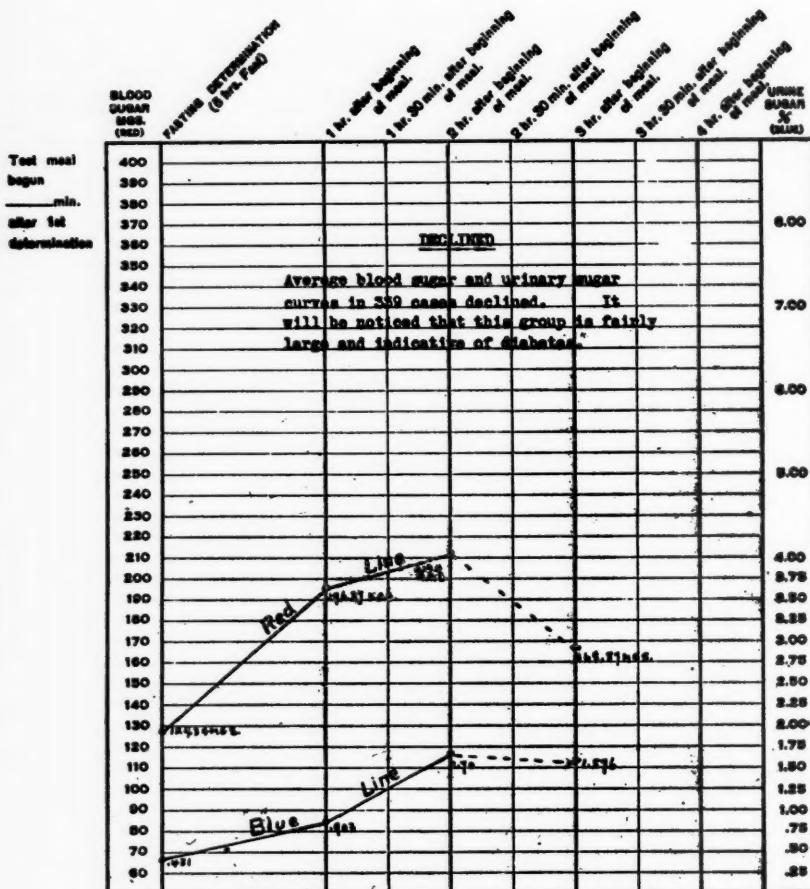
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## CLASSIFICATION:-

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## CLASSIFICATIONS

The solid line represents the average as obtained from the number of cases stated above; the dotted line is obtained from a smaller number.

Dr. Brathwaite—The attached seven charts have been constructed from a study of 1,007 blood sugar determinations made recently for the Equitable Life in applicants applying for insurance in whom sugar was found in the urine at the time of the examination, or a history of the same.

Each chart numbered from one to seven, represents the average blood sugar content as determined, after veni-puncture, by the Folin Wu method; fasting; one hour after the beginning of a test meal; two hours after the beginning of a test meal and in some instances, three hours after the beginning of a test meal. Each chart also shows the average percent of urinary sugar found at times corresponding to the blood sugar determinations.

The red line shows the blood sugar content in milligrams per 100 c.c. of blood with the indicator for the same at the left of the chart.

The blue line shows the percentage of sugar in the urine with the indicator for the same at the right of the chart.

Each of the seven charts assumes an increasing mortality from Chart #1, which is assumed to be normal, to Chart #7, which is assumed to represent a probable mortality in excess of 270%. The percentages of mortality assumed increase from Chart #1 to Chart #7.

The formula alluded to in the caption on certain charts is empirical and its effect is described thereon.

Dr. Mann—Those of us who are in the practice of Internal Medicine naturally see many cases of glycosuria; and have an opportunity to study blood sugar series obtained from them. In the aggregate, however, unless we are making a specialty of diabetes, the number of such cases is not sufficiently large from which

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statistical data may be collected for insurance purposes. With this in mind, therefore, I wish to bring to the attention of this Association some opinions held by Dr. H. J. John of Cleveland.

At the meeting of the American Medical Association in Washington in May of 1927, Dr. Frederick M. Allen in discussing a paper on "Diabetes" by Dr. H. J. John made the statement that probably no one in the world had such an extensive series of blood sugar curves following the ingestion of 100 grams of glucose as Dr. John, and supplemented this by saying that in addition he had had the great good fortune to have been able to follow so many of these cases through so many years; and looked forward to the time when the compilation of them would enable students of carbohydrate metabolism to profit by his experience.

"After the ingestion of 100 grams of glucose, if the curve comes back to the normal limit within 3 hours, the individual is considered non-diabetic. If more than three hours is required, he is considered diabetic; but in cases in which the return to the normal level hovers about the 3-hour period are considered as in the prediabetic state.

"There is no such thing as a fixed 'normal renal threshold' (usually placed at 170 mg. per 100 c.c.) for all individuals. Every individual is a law unto himself, and may have either a high or a low renal threshold, an 'individual threshold' which is normal for the individual in question. This threshold changes in cases of untreated diabetes and perhaps in nephritis cases also. In every individual the kidneys become permeable to sugar at some blood sugar level; but this level varies in different normal individuals, in different diabetics, and no doubt in the same individual at different ages. Among diabetics the permeable level is greatly raised ordinarily, but there are marked ex-

ceptions. The teaching still persists that the average renal permeability for sugar in normal individuals is 0.17%.\*

\*Dr. John feels that probably 0.16% is the upper limit of such normal reactions at the height of their curve, and in this Dr. Mosenthal agrees.

"In general in non-diabetics the blood sugar content rises promptly after the ingestion of glucose, and there is an equally prompt return to the normal level or below, whereas in diabetics, the blood sugar curve rises slowly and to a higher level with a correspondingly slow return of the curve to the normal level. In the diabetic the return to the normal level takes from 4 to 9 hours, whereas in the non-diabetic, this return to normal is accomplished in from 1 to 2 hours. Thus in the diabetic individual the blood is flooded with sugar for many hours; whereas in the non-diabetic it is flooded but for a short period. The curve in a mild diabetic goes up to about 180 or 200 or 250 mg. per 100 c.c. at the end of one-half or one hour, and then returns to normal from two and a half to three and a half hours."

In a personal communication received from Dr. John in January, 1928, he makes the following statements—

"As to the time in which the curve in renal diabetes should return to normal. I apply the same rule in the normal individual because if we deal with hyperglycemia which does not come back to normal in 2 1/2 hours, it is no longer renal diabetes but frank diabetes. The curve of a pure diabetic is very high, but the renal diabetic is low.

"As yet I have not seen a case in my series which I have interpreted as renal diabetes who later developed diabetes and some of these cases have been fol-

\* ("Glucose Tolerance and its Value in Diagnosis" by Dr. Henry J. John in "The Journal of Metabolic Research," Volume 4, 1923.)

lowed for many years. Renal diabetes is not an absolute protection against diabetes because a renal diabetic, the same as any normal individual, could develop diabetes later in life due to other causes.

"The response of renal diabetes to the same doses of glucose is practically the same with the only difference that glycosuria is present most of the time, whereas in the first case it may be that sugar will be present only in one of the specimens and none in the others. In a renal diabetic I often find glycosuria when the blood sugar is below 120 mg. per 100 c.c., which speaks, of course, of a very low threshold.

"As to the importance of the height of the curve during the test, I must say that I cannot answer definitely, but I am inclined to think that it has little or no significance. On the other hand, the time that it takes before the curve returns to normal is of the greatest importance, and I have in my own mind laid the boundary at 2½ hours after taking 100 grams of glucose. That is, the group of cases which return to normal 2½ to 3½ hours after, I consider as mild diabetics or prediabetics; those returning to normal after 3½ hours, after taking the glucose, are more severe diabetics. There are, however, some cases where the blood sugar during the test does not go high at all but stays at a comparatively low level above normal for 3 or 4 hours. These cases I am not able to explain. Again a curve with such a mild rise coming back to normal in three hours and another one coming back to normal in more than three hours, I should interpret the latter one as frankly diabetic, whereas the first one as mildly diabetic."

In a paper contributed to "Endocrinology" (Volume 10, 1926), he summarizes his opinions as follows—

- (1) Eight cases of non-diabetic glycosuria which are reported in this paper have been observed over periods ranging from two to eleven years, during which time the patients have not had diabetes.

- (2) These patients have had a full diet throughout the periods that they have been under observation.
- (3) The ages of these patients ranged from 2 1/2 to 44 years at the time the glycosuria was discovered.
- (4) Literature on non-diabetic glycosuria includes reports of cases for varying periods up to 35 years, throughout which a normal status was maintained.
- (5) The highest daily excretion of sugar in the cases reported in the literature was 30 grams per day.
- (6) The observations of non-diabetic glycosuria show that it is an innocent anomaly requiring no restriction of diet or other treatment.
- (7) The importance of repeated examinations in cases of glycosuria which is supposed to be non-diabetic in character is emphasized, as is the necessity of glucose tolerance tests, in order to make sure that the glycosuria is not due to diabetic or a pre-diabetic condition.

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## Non-Diabetic Glycosuria

Case	Age when Glycosuria was discovered	Sex	Length of time cases have been under observation
I	32 years	M	7 years
II	30 years	M	11 years
III	16 years	M	5 years
IV	46 years	M	10 years
V	44 years	M	2 years
VI	34 years	M	6 years
VII	17 years	F	7 years
VIII	2 1/2 years	M	5 years

## Summary of Observations of Various Authors on Non-Diabetic Glycosuria

Author	Age of Patient at Beginning of Treatment	Sex	Period of Observation	Daily Sugar Output
Parkes, Weber T.	—	F	35 years	30 gms.
Holst, J. E.	24 years	M	23 years	
Holst, J. E.	7 years	M	22 years	1%
Labbé, M.	6 years		19 years	
Allan, Wm.	17 years	F	18 years	16-49 gms.
Johnsson, A.	28 years	F	16 years	
Johnsson, A.	—	F	16 years	
Bailey, C. V.	—	F	11 years	20 gms.
Garrod, A. E.	8 years	F	11 years	
Labbé, M.	6 years	F	11 years	1.2-0.03%
Johnsson, A.	25 years	M	10 years	
Johnsson, A.	—	M	10 years	
Garrod, A. E.	12 years	M	9 years	
Paullin, J. E.	16 years	M	7 years	34 gms.
Lemann, I. I.	15 years	M	6 years	Traces
Lewis, D. S.	—		5 years	25 gms.
Lewis, D. S.	—		5 years	16 gms.
Lemann, I. I.	4 mos.	M	3 years	Traces
Faber, K. and Norgaard, A.	26 years	F	3 years	60-80 gms.
Marsh, P. L.	22 years	F	1.3 yrs.	50-60 gms.
Marsh, P. L.	—		1.25 yrs.	15-122 gms.
Lemann, I. I.	19 years	M	1 year	Traces
Marsh, P. L.	74 years	M		30-50 gms.
Goldbloom, A.	20 mos.	M		1%

In concluding my remarks on this subject, I would like to emphasize the importance of a careful investigation of cases of obesity who show even small amounts of sugar in the urine, since this condition is often a precursor of diabetes.

Dr. Muhlberg—I was very much interested in the paper of Dr. Bradshaw and Dr. Carber. I believe our Society could make rather valuable contributions to scientific medicine if more papers of this type were submitted.

About a year ago we organized a Heart Council in Cincinnati, of which I was made Chairman. I felt that if any progress was to be made in reducing the heart mortality, particularly past the age of forty, after which age it appears to be increasing, that we must first of all have some very definite knowledge as to conditions leading up to heart disease.

I had hoped to be able to get some very valuable information from the statistical studies of the Medical Directors' Association, but was rather disappointed to find that that field was soon exhausted. However, I did succeed in making an investigation from which several very interesting deductions might at least tentatively be drawn.

In the first place, in spite of the fact that the average age of insurance applicants is about thirty-eight or thirty-nine years old, I found that there were at least twice as many reports of systolic apical murmur before the age of thirty-eight as after the age of thirty-eight. The increase in mortality of the younger group could by no means account for this rather marked reduction. It would appear, therefore, that many of the mitral systolic murmurs at the younger ages disappear in the forties.

Secondly, in spite of the known relationship of syphilis and heart disease, I could not demonstrate any increase in heart disease among syphilitics of good habits who were thoroughly treated.

On the other hand, I found that among the six

hundred policyholders to whom we issued policies some fifteen years ago in spite of high blood pressure, about 35% have died in less than ten years and two-thirds of them died of cardiorenal vascular disease.

I therefore urged the Heart Council to approach the problem, not with the viewpoint of discovering heart disease so much as with the viewpoint of discovering conditions that lead up to heart disease, and among these conditions, I was sure that high blood pressure, overweight and Bright's disease played a dominant part. I was also very suspicious that diabetes, which is in reality a very prevalent disease, probably accounted for more heart deaths than we suspected.

We are at the present time making a survey of one thousand men past the age of thirty-five, engaged particularly in clerical and executive duties in the various offices in Cincinnati and I am sure that among them we will find many that are on the high road to eventual heart collapse; and it is not unlikely that through catching them in the incipient stage of high blood pressure, diabetes, Bright's disease and thyroid troubles, we will be able to avert some heart deaths that would be inevitable within the next ten years or so. I am very pleased to note that the paper of the essayists confirms that suspicion.

The organic heart disease rate as shown by their tables is over twice as great among cases with a history of sugar, as compared with their general experience for practically the same age. The anginas were almost twice as great; and what is also rather significant, the Bright's disease deaths were not notably increased. This of course would lead one to suspect that persons predisposed to diabetes were also notably predisposed to degenerative heart disease, perhaps

through a tendency that diabetes has in causing arteriosclerosis.

As the essayists indicate, it is rather unwise to draw definite conclusions from these studies, but I feel that their results are sufficiently convincing and their material sufficiently large to warrant the suspicion that one important approach in the prevention of heart disease would be the control of those in the early stages of diabetes, and this of course, can best be managed by encouraging annual urinalyses. There is, of course, no doubt that incipient diabetes can either be cured, or more likely can be held in abeyance for many years, by a proper diet and supervision.

Dr. Daley—Dr. Folin, will you start in and give us the benefit of your wide experience on this subject? (Applause.)

Dr. Folin—I am in an even worse situation than Dr. Muhlberg. I didn't know that my name was to go on the program until I got here, nor did I see any particular thing to discuss where there isn't any preceding paper to give me the cue. I am a little worse off for another reason. We men in the medical school haven't got the diabetic sort of glycosurias to deal with that you people have. We have to scratch our heads or scratch something in order to get them when we want to study them. Nevertheless, we are, of course, working at it from the standpoint perhaps of closer scrutiny than you people can where you have so many cases to be covered in a given time. So I thought perhaps I could say something that may be of interest to you with regard to glycosuria as we look at it.

There is one important point to us with respect to glycosuria which is theoretically of very great con-

sequence but which to you at present is more or less an academic one. That is the question as to how far the sugar of urine is glucose and how far it is represented by other reducing materials, reducing carbohydrate materials. This point has, however, a practical application in relation to your field work at least in relation to testing urines for sugar. There is absolutely no question—I think all of us medical school fellows are now pretty well agreed that at all events the sugar in non-diabetic urines is to the extent of at least 50 per cent something else than glucose, but now the trouble is that you are going to test for that something else and consequently you are often going to get positive tests for sugar when there shouldn't be a positive test in any sense of having any real significance. Whether you get a positive test or not will often depend upon the time of day you make that test. It will depend to some extent on the make-up of the individual, to a very great extent upon the kind of meal that man had just before he came to your office or to the place where the test was made.

With the present increase in the consumption of commercial glucose in connection with all kinds of bakery materials, you have an enormous increase in the amount of material in the urine which gives positive test for sugar. I feel, of course, I really ought to be talking to field examiners rather than to you men in the central offices, for it is those men who run into these cases I am speaking of. Even a glass of milk will contribute something to the reducing quality of the urine, for that milk sugar will get into the urine in the form of galactose; also it is very seldom that we say anything about cane sugar. Yet, as a matter of fact, I think in anywhere from 5 to 10 per cent of

normal individuals there will be some absorption of unchanged cane sugar when a considerable quantity is taken. Now cane sugar, of course, does not reduce the ordinary reagents which we use, but that cane sugar after it gets into the ordinary acid urine is fairly rapidly converted spontaneously into dextrose and glucose. So that in the case of cane sugar also we have a contribution to the finding of a positive test for sugar in the urine when it would be best for all concerned if the test turned out negative.

From a practical point of view, I daresay that most clinical tests for sugar in urine are therefore made at just the wrong time. The field men, for example, go to the houses of the applicants and test their urines, we will say, at seven or half past seven o'clock in the evening, or eight o'clock. That is just the wrong time. It is just an hour to an hour and a half after the heaviest meal of the day and when a great number of them will give positive tests, tests which those same individuals would not give at a different time of the day. So that I should like to point out that urines collected for such purposes ought to represent for advantageous results not less than three hours after a meal. That gives time for the cleaning out of that peculiar outflow of reducing materials which we get in urines after meals and which have no significance whatsoever in relation to application for life insurance.

Glycosuria itself is very difficult to utilize in most cases as a diagnosis for diabetes so that we are interested in the glycosuria nowadays much more in connection with the level of the sugar in the blood. It is to be noted, however, that the blood sugar story is of comparatively recent origin and that we haven't

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yet, notwithstanding the figures that are cited here from Dr. John, we haven't yet enough data to use statistically in relation to the incidence of diabetes based on reliable blood sugar determinations.

What I was coming to, however, in connection with the glycosuria itself is this, and I want to try to make that clear: First, all of you will agree that in the past omitting the last few years that previous to that period all of the insurance companies refused an enormous number of applicants on the basis of positive sugar tests in the urine. That we are agreed to, I think. I doubt whether anybody will deny that. But to that I should now like to add that I believe that you are still declining unfairly on the basis of sugar tests applicants for life insurance ten times for every one time that you unjustly or erroneously accept an applicant on the basis of the test for sugar on the basis of the sugar reactions. In other words, I think you have still considerable room for increasing the number of applicants which you take without materially increasing the number of those cases which are going to die of diabetes, either directly or indirectly, but which will turn out to be diabetics, provided only that you are willing to give enough time to this study of these cases. There is one minor point in this relation which seems to me to be of some consequence. You have on record thousands, if not millions, of cases from which your statisticians can deduce certain valuable information. Studies of that sort, however, can be made only on cases which have been accepted. You are not able to supply any corresponding information with regard to the subjects which you have failed to take. Therefore—now, I don't speak so much from your insurance or from a business standpoint as from

ours—even if you should make a few errors in the acceptance of cases, you would thereby provide material for statistical study that would very greatly promote exact knowledge of what can and cannot be accepted—so that personally I should much hope to see you taking a few mortals who afterwards turn into diabetics rather than discharge twelve of them and give us no information at all.

However, blood sugar is, of course, the sharper tool at the present time for the study of diabetes, but I want to tell you one or two things about blood sugar which I am not sure that you know. I daresay that all of you have the idea that there is a certain definite level for blood sugar, normal blood sugar, under fasting conditions. That isn't true at all. The fasting blood sugar level will depend upon the time of day when you take it. If you wake up a fellow at two o'clock in the morning, just have him stick out his finger. You can take it and he will hardly waken. Then take his blood sugar. You will find that at that time it will be about 80 milligrams per cent. I think that that is one of the reasons why the diabetics often go into insulin trouble in the middle of the night. It is perfectly normal for the sugar to fall during the night and I suppose the diabetics are not different in that respect and consequently when they have had insulin, the shock from it is apt to come sometime in the middle of the night.

If instead of taking the blood sugar at two o'clock in the morning you take it at eleven o'clock in the forenoon, I daresay this entire crowd here would average not less than 120 milligrams per cent. So you see there we have a variation of fasting blood sugar levels of not less than around 40 milligram per cent. That

is a very considerable amount. Therefore, in taking the blood sugar, we must recognize that the normal level is materially higher than what we usually speak of now as the normal level. We all say the normal level is around 100, at least a fasting level. It isn't any such thing. Also it is an entirely different thing if you were compelled to study as we do medical students, for they are in the best years and they are apt to show the lower blood sugar levels whereas just as soon as a person grows a little older, there the responses become a little less speedy and the result is that he is apt to carry a little higher level of blood sugar. My own constantly runs now 120 to 125 in the late morning when I take them, whereas I used to think I was carrying 100. On the other hand, I usually used to carry a little sugar in my urine. Now I carry none at all. It has gone to the blood instead. What is it doing there? One doesn't worry me more than the other, because I know I have no diabetes and am not going to have it.

You have heard this afternoon, and we always hear, of test meals and we give in connection with such test meals 100 grams of sugar. Now, in the blood of the normal individual, there is under ordinary conditions but 5 grams. As Dr. Joslin would put it, there is one teaspoonful. If it should happen to be 2, the situation is very bad indeed. Normal will have one teaspoonful, 5 grams, and the diabetic will have two. The reason I point that out is because after all it is a little difficult to comprehend why in connection with the large intakes of glucose we should not get larger variations than that as a matter of fact we do in this limited area which normally contains only 5 grams and through which all of that sugar must pass. Also

all individuals are not of the same weight and I have often wondered whether we should give 100 grams of glucose to everybody. It seems to me perhaps that the more logical thing would be to have a dose according to the weight of the individual. That is very commonly done, of course, usually 1 gram per kilo or 1/2 gram per pound of body weight. That, I think, would yield fully as good results as giving 100 grams. The 100 grams is a pretty large dose for the small individual and 50 grams would produce just as high a rise of the blood sugar. In fact, 25 grams are likely to produce just as high a level as, say, 100 grams and the only difference is that with the 100 grams it will take longer for the sugar to reach what you may choose to call the normal level than it does with the smaller amounts, and also that it will fall further below the normal level. If you give 50 grams of glucose, the sugar will rise just as high and just as quickly.

Some of the speakers, I think, on the program have intimated that it makes a difference how long it takes for the sugar to get to the maximum. I don't believe that that point depends upon the amount of sugar given. I think you can get the maximum blood sugar level after an ingestion of glucose even, I should say, 25 to 40 minutes after the ingestion of the sugar. So the way I should like to see such a test made would be to make a blood sugar determination before any sugar is given—first to be sure where you have the individual; second, to give a moderate dose of glucose; then to examine the sugar at the end of 30 minutes to get a picture of the maximum rise obtained. By the way, I don't believe it is true that the renal glycosuria cases fail to give a hyperglycemia just about as high as normal individuals. The differ-

ence between the renal glycosuria case and the normal individual is that he will begin to create sugar at a lower level, but the sugar will rise, I think, just as high in the renal case as in the others, nor can I see any reason why it shouldn't, because, after all, it is only a question of raising that 5 grams in the blood up to less than 10, which is about what we get in all of the normal individuals. The third point in connection with such a test would then be to make another blood sugar at the end of two hours. The advantage of giving a smaller amount of sugar would be that you wouldn't have to wait quite so long to get a normal expectation of the original level of the sugar that you had before you had given him sugar at all, and I assure you that you ought to get just as high increases as you would from the larger doses, the giving of 100 grams of sugar particularly in a small amount of water, as some of you do.

One hundred grams of sugar, we will say, in 200 cc. of water I do not consider good. It is too concentrated and you are going to get an anomalous situation because there is going to be a great influx of water into the digestive tract on account of the osmotic pressure of the sugar. When you have 100 grams of sugar and 250 c. c. of water, you see, you have substantially a 40 per cent solution of water. That is too strong, I think. If you use 100 grams, you ought also to give more water. (Applause.)

Dr. Bradshaw—There is very little to add to the discussion. In answer to Dr. Muhlberg's criticism, I might say that we are unable to separate the acute and chronic types of nephritis, but I think if we did, we would find that the deaths from chronic nephritis would show quite a marked increase in cases where glycosuria had been present.

Our paper does not quite bear out Dr. Folin's criticism that all the people who have sugar are safe or that a great many people who have sugar could be safely taken for standard life insurance, and I believe that we have touched on a point in selection which needs further study, a good deal further study, before the final solution is arrived at.

Dr. Folin also said that it didn't make any difference about the amount of glucose given. The literature lately has had numerous papers in which the same conclusion was arrived at and I believe we could well reduce our amount of glucose used in the test to 50 grams and still have equally as good results. We frequently hear criticism from applicants who are submitted to 100 grams of glucose that it is a very disagreeable dose and, in fact, a good many men refused to take that dose because of adverse criticism from friends who previously had to take such an amount. I think if we adopt a 50-gram dose, well diluted, we would have equally good results and less dissatisfaction among people who have to take it. (Applause.)

Dr. Daley—Dr. Folin always gives us some very valuable points. He shows to us pitfalls that we are apt to step in and he gives us a great deal of material to think about. Dr. Folin spoke of the presence of other sugars in the blood beside glucose and I am going to ask Mr. Wolf, director of the laboratory of the Equitable Life Assurance Society, if he will not give us a few words on this subject and tell us how his laboratory examines for and eliminates the different sugars.

Mr. Wolf—Do you refer to the sugar in the blood or sugar in urine?

Dr. Daley—Both, and I would like to have you make

any remarks on any other thing along this line that you would like to say.

Mr. Wolf—We use as a preliminary test an alkaline copper solution and if a reduction is obtained, we submit the specimen to the phenylhydrazine test, looking for the typical osazone crystals. The specimen is then submitted to the quantitative test. We find a number of specimens in which we obtain a reduction in which no definite osazones are found. These specimens are reported to the Medical Director as giving a reduction equal to a certain amount of glucose which is not due to glucose or pentose. That is as far as we have been able to go in connection with the urine. With the blood we are at the present time using the newer method of Dr. Folin, mentioned in the Journal of Biological Chemistry, Vol. LXXVII, May, 1928, and find this test a very acceptable one. I think, instead of using 0.1 cubic centimeters of blood, we can get along with 0.05 cubic centimeters, which would be equivalent to a little over one drop. This would mean less torture to the applicant and probably in a number of cases would do away with some of the squeezing necessary to obtain the 0.1 cubic centimeter, and would reduce the likelihood of the specimen being diluted with tissue fluid. At times when we have found pentose in the urine and when a blood sugar determination was called for, we also found it in the blood.

Dr. Daley—Thank you very much indeed. The subject is open for general discussion.

Dr. Knight—Mr. President, with reference to the one point that you brought out in your initial statement, that the deaths of those who have diabetes are going from a rate of 11 up to 23 and suggesting that we have ever so many more people dying with diabetes

than we previously did, Dr. Joslin was over for a luncheon conference with us last week and in discussing that point with him, having in mind that we had expected there would be a much less death rate from diabetes than before the use of insulin, he insisted that the reason we get that higher rate is because more people with diabetes are living at the older ages. They are not dying at the younger ages as they formerly did. The disease is being detected more often than formerly, particularly in women. This increases the number of living diabetics. His younger people dropped in their death rate very sharply and have stayed there, while the average age at death of his patients has gone up from 42 to 59 so that more people are living longer with diabetes. The deaths from coma among his patients have dropped to practically nothing.

Dr. Shewbrooks—I have been very much interested in Dr. Folin's remarks, and I had hoped that he would have something to say about the blood sugar curve; how high it could go and still remain normal—for instance, at the end of one, two and three hours. I would like to know what he would consider as a normal blood sugar curve, expressed in milligrams per 100 cubic centimeters of blood.

Dr. Cort—About a year and a half ago our company, being very much interested in doing a certain amount of blood chemistry in order to assist our underwriting, inaugurated the system of collecting blood for our blood sugar analysis that we felt might be applicable to field work. It was our understanding at that time that while blood sugar chemistry was being carried on in commercial laboratories and at the Home Offices of the various companies, the test fell short of tak-

ing care of the large group of cases who were applying for small amounts of insurance and were remote from modern laboratories. Coincident with this time there was published in the Boston Medical and Surgical Journal an article by Miss Hunt who used Dr. Joslin's technique in the Deaconess Hospital—the so-called Micro method for blood sugar determination. We adopted this method, known to all of you, and made it applicable to all of our cases applying for insurance in our Company, whether for large or small amounts, who showed any reduction to Benedict's or Fehling's solution at the time of the examination; or who showed a past sugar impairment that had not been satisfactorily cleared by a blood sugar estimation of any other company. In other words, it was a wholesale method of getting blood sugar estimations in doubtful cases from the entire field of our applicants.

The Micro method has been discussed before this body and is known to all of you. I think in a fair measure that the Micro method, as supported by the opinion of Dr. Joslin and as it has been employed in the Deaconess Hospital in Boston, is a fairly accurate, reliable method, open, of course, to a good deal of criticism because the determinations are so dependent upon very careful and accurate pipetting with results that are not always uniform by all laboratory workers. There has been introduced, as published recently, by Dr. Folin a very much superior method as outlined in the Journal of Biological Chemistry, Volume 77, May 2, 1928, not only because its technique is easier to carry on but because its final reading by a Deboseq colorimeter yields so much more uniform findings in the hands of the average

technician, and for that reason we are substituting at this time the method of Dr. Folin for the method published by Miss Hunt; but we are still adhering to the so-called Micro method as our laboratory determination, because it requires only a very small amount of blood which can be very conveniently obtained at the time of the examination by our Examiner from the finger or the lobe of the ear of an applicant and can be shipped to us in a special container devised for that purpose.

Within the last year and a half we have had the privilege of underwriting 362 cases who have showed a reduction for sugar at the time of the examination or who have had past sugar impairments. There were sent out a little over 500 authorizations for such blood sugar determinations. The difference in figures could be represented by those applicants who refused to take the test meal of 100 grams of glucose or because the time of the examination had expired, etc. Out of these 362 cases underwritten there were 152 cases rejected for blood sugar peaks higher than we accept. We were able to accept 210 of them and 137 of the 210 were accepted as standard.

Now, as to what constitutes our standard response to the 100 gram glucose test meal. We set for ourselves a definite line of blood sugar concentration of .16 or 160 mgs. of blood sugar per 100 c. c. of blood, and a urine free from sugar as a normal response to this glucose load. There are two blood specimen bottles sent out at the time the examination is authorized. The applicant is supposed to have been met by our Examiner at an earlier time in the morning, preferably not sooner than three hours after his last meal, presumably his breakfast. A specimen

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of blood is taken at this time from the finger puncture which consists roughly of three or four drops, together with a specimen of urine. He is then given 100 grams of glucose lemonade solution and one hour after a second blood specimen and a second urine specimen are obtained. These are forwarded to our Home Office by mail in a specially devised packet provided when the blood sugar special examination is authorized. Any applicant who can stand this test of 100 grams of glucose and who does not show a blood sugar peak in excess of .16 one hour after the ingestion of 100 grams of glucose with no sugar in the urine is considered a standard risk and is accepted for standard insurance. The few cases out of this group that were accepted as substandard risks were those cases who did not show a sugar peak above the point that I have named but did show some sugar in their urine, but the amount of sugar in their urine in no case was acceptable when the amount reached 1.5%.

Therefore, it would seem as though we had limited ourselves more or less to the underwriting or the separation, you might say, of those people who reacted in a perfectly normal way to the glucose tolerance test and those who did not. The group who showed a high peak with sugar in their urine we considered as diabetics and uninsurable. The group that showed a blood sugar content in excess of our peak limit with urine sugar free we looked upon as either mild diabetics or potential diabetics and made no endeavor to underwrite. The second sub-group whose blood sugar peak did not exceed .16 and who showed urine sugar not in excess of 1.5% we consider as renal glycosurics and impose our substandard rating of 150%.

I believe that there still remains a third subgroup among these abnormal reactors whose blood sugar concentration may rise quickly above the normal limits and return promptly to normal individual levels with urine sugar free, and who might be considered as insurable with suitable ratings providing one could have a plotted chart of their blood sugar curve. Of all the tests employed for the determination of an individual's ability to react or handle the glucose tolerance test, it is my feeling that the return to a normal curve for that particular individual is by far the most important. If you can have only one result from such a test, I think that is the most important. I am not convinced at this time that it makes a very great difference as to how high the blood sugar content may rise providing that the threshold in the kidney rises in parallel fashion, but it is of the greatest importance to know what the blood sugar content might be of an individual a reasonable time after his test meal and whether or no it will return to that level within a definite time.

So, we have a feeling in our Company that we need only add one more determination to our method of handling sugar cases which will be a third specimen within a fixed time which will show us that the curve has then returned back to the normal predetermined level for that individual; and when we have this I am convinced that we will have a complete chart satisfactory for all practical purposes for both standard and substandard underwriting. With the cutaneous blood which amounts to only three or four drops and is easily contained in our bottles with a capacity of .4 of a c. c. when we use .1 c. c., and Dr. Folin's

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new method of sugar determination, we will have as satisfactory a method of underwriting the great group of people who respond abnormally to sugar tests as can be conceived at this time.

I am very pleased to hear from Dr. Folin that he does not believe that 100 grams of glucose is necessary in order to get a proper indication of the response of an individual to a sugar tolerance test. It was only a month ago that I had the pleasure of talking to Dr. Joslin and I asked him what he thought about it, and he very frankly answered before a group just such as this by saying, "I think it is an awful thing to give anybody." I am not sure but what just as satisfactory results could be obtained by an ordinary mixed meal provided we had a certified statement from either the Examiner or the agent as to the type of meal ingested. It is then only a matter of simple calculation to transfer this into the equivalent of glucose which we use for the tolerance test. I think that if we reduce our 100 grams of glucose test meal, which is now universally accepted by all as the standard tolerance test, we should also in the same measure shorten up the interval of time between the ingestion of that glucose test meal and the collection of our first specimen, and I think that was Dr. Folin's suggestion. With 100 grams of glucose you may allow perhaps an hour or an hour and a half to elapse and get a reasonably accurate indication of your blood sugar peak, but if you are going to diminish the amount of the tolerance test, you must also shorten up that interval of time and you could likewise shorten up the interval of time before your third specimen. I thank you. (Applause.)

Dr. Daley—A very interesting talk, Dr. Cort, and

very timely. It was the practice of the Equitable to give the applicant a test meal which was witnessed by our doctor, who saw what the man ate and the calories were estimated. We found it was necessary to have a doctor present because sometimes an applicant would muss up his plate to such an extent that he didn't get many calories in him. So I can say that the majority of the blood sugars here reported were so taken.

We have given this up to a large extent because of the expense and the time that it took. That is the only reason. We would like to have kept on with the meal if we could, but it was not practical for insurance purposes.

Is there anyone else who would like to make some remarks. This is something that is disturbing us all, these sugar cases.

Dr. Dillon—The use of Micro methods has become very popular lately and certainly very useful. However, I should like to point out that the normal sugar curve which is obtained by using the Micro method is different from the curve which one gets from using venous blood. Ordinarily when we use the Micro method we get our blood from pricking the finger tip. Now, this is capillary and not venous blood.

In 1923, in the Journal of Biological Chemistry, Dr. G. L. Foster of San Francisco published an article in which he showed that the fasting blood sugars as determined from venous blood and from capillary blood gave the same values, but following a dose of glucose, one hour after the dose, the capillary blood contains as much as 90 milligrams more glucose than the venous blood, and even two hours after the glucose test the usual thing is to find 30 or

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40 milligrams more of glucose in the capillary blood than in the venous blood. Therefore, if we are going to use Micro methods, it seems to me that we shall have to revise our normal sugar curves.

Dr. Daley—Thank you, sir. That is a very good point. In our laboratory we have been running a series of parallels between the venous blood and the finger blood, they both being taken at the same time. We have not made enough of these tests to make a positive statement, but the difference so far has been so small and the differences when they were large referred to those cases which showed such a large amount of blood sugar that we considered them uninsurable, that we have come to the conclusion that the capillary blood is satisfactory for our purposes.

Is there anyone else that would like to speak on this subject? I am very glad that this point was brought up, the difference between capillary blood and venous blood, because Dr. Folin has been of great service to those people unfortunate enough to have sugar in their urine in helping them to obtain life insurance and the Micro method has cut out their fear of the veni-puncture and has enabled us to examine more of these cases than we otherwise would.

Anything further before we ask Dr. Folin to close? Dr. Folin, will you kindly again favor us?

Dr. Folin—I will take the last points first as they are a little fresher in my mind, so I will begin with the last question as to whether we can make just one blood sugar examination and on the basis of the results have some minimum which might be accepted as showing that the case shall be accepted or rejected. I should hesitate to give any such figure at the present time, and it seems to me that it would

be much better to keep an open mind for a year or two, for I think now that a great many will be making determinations, that we can speak more wisely about it in another year or so. Therefore, I should rather not give any such figure, but in most cases, I think a single determination is likely to prove pretty instructive at least.

As to the sugar content of the venous versus capillary blood, as was brought out here and commented upon by our Chairman, I wish to say that the differences between arterial blood and venous blood does not ordinarily differ by anything like 30 milligrams. Those were the maximum figures that Foster obtained and the maximum that others have obtained. Usually the difference, just as our Chairman has stated, is very much smaller than that. Moreover, the new blood sugar method, if used according to the original, by taking care of certain slight modifications which will be described shortly, gives blood sugar values that are anyhow several milligrams below those obtained by the Folin-Wu method, so that the finger blood values obtained by the Micro method will be substantially better than those given by the Folin-Wu method, and they may be accepted, I think, without its involving any great discrepancy on that point.

We were told—I didn't put down the names here—that somebody is doing the blood sugars very satisfactorily by the new method on the basis of three or four drops of blood, which are brought into the laboratory. I want to make it very clear that I have no personal experience on a point of that sort. You know, of course, that blood sugar does fall pretty rapidly in blood that has been collected and is standing, and in that connection I would therefore particu-

larly call attention to a paper that was published a few months ago by Dr. Rose on the preservation of such blood. So if you collect only three or four drops of blood and they are to be kept any length of time before an examination is made, be sure to use enough sodium fluoride so that you actually get all the sugar that was there originally.

In regard to Miss Hunt's new Micro method, which was developed in Dr. Joslin's laboratory, I kept, of course, in touch with that development. It is just a Micro modification of my original Folin-Wu method and Miss Hunt has given that up in favor of the new method, the new Micro method. The method is particularly important in diabetic clinics in connection with frequent determinations that have to be made in such places and particularly in the determination of sugar in the blood of children. They don't like to stick the children very often and I believe that Joslin has a rule in his laboratory that any officer who fails to get blood at the first punch of the needle has to give the patient a dollar in order not to abuse those children. Now, all that will be obviated because they don't mind at all being stuck a little below the skin in the finger or ear.

As to how high the blood sugar should go and how high it should be at the end of two hours, that will depend, as I think I intimated, on the amount of sugar taken. If you give a very large amount of sugar, the level which you will find at the end of two hours will be somewhat different from what you will get if you use only 50 grams, and there again I shouldn't like to lay down any definite rule. I think you will be able to make those for yourselves as you get to

compare notes after you have made a lot of blood sugar determinations. The sum total of the number you will make is very much larger than we can make in our laboratory.

In connection with the test meal, there is perhaps one point that ought to be mentioned, probably it is superfluous, but it won't hurt to mention it. I wonder if any of you are a little too economical in buying the glucose. I am afraid that some may perhaps be buying poor grades of glucose for the test meals. If you do, you are running into exactly the trouble that we have mentioned in connection with bakers' pastry. You are going to get anomalous results and particularly a large amount of reducing material in the urine, so please use pure glucose and if you can cut down the amount from 100 grams to 50 grams, you still are saving money.

Dr. Exton has suggested to me that cane sugar might perhaps be used as a substitute for glucose. I see no reason why cane sugar might not be used. The only objection that I can think of in connection with it is that if you wait too long, you might get too much sugar in the urine, because a certain number will absorb cane sugar, but in the course of an ordinary test meal, cane sugar, I think, would yield perfectly good results. I am quite inclined to agree with Dr. Exton in that respect; in fact, I think one could use a variety of substances. I think perhaps an ordinary meal as has been used could be used, and in that connection, I would particularly suggest that a meal made of rice, cooked rice, with a little cream on it, would be also good and if you take the figure at the end of three hours, you will get a very fair result, for the urine and the blood. I speak of rice because

it is substantially pure starch and in it you will get no contamination of those foreign sugar materials which are so common in all kinds of both raw or heated foods. Starch heated in water doesn't produce any foreign reducing carbohydrates.

I don't know if I have covered all the points that have been raised. I don't think that the maximum peak that one gets is of any consequence. I don't believe that that point is very interesting and one gets it by taking the puncture at the end of about 30 minutes. It is an interesting point, but I doubt if it has very much significance. It comes very quickly and it isn't true that the rise of the blood sugar and the fall to the normal levels go at substantially the same rate of speed. I would rather say that most individuals will get the maximum rise in about 30 minutes whether you give them 50 grams or 100 grams or in fact 200 grams, but that the fall to the normal level will be delayed the longer the more glucose you take. In that connection, it will also fall to a lower absolute level, to a much lower level than the original sugar if large quantities are taken, but I have my doubts as to whether the height of the peak itself is of very much significance. (Applause.)

Dr. Daley—Thank you, Dr. Folin. Dr. Cort, I believe your Company carried on a series of parallel tests between the veni-puncture and the finger puncture, between the Micro method and the other method, to determine whether your Company could use the smaller amount of blood without the sacrifice of safety. Isn't that true?

Dr. Cort—Before we attempted to establish our method of blood collection, through Dr. Cragin, our Associate Medical Director, we collected a small amount

of blood required from the so-called finger puncture, forwarded the same to the Home Office laboratory for determination, and checked the individual at the same time with the commercial laboratory by venipuncture. Now, this was not carried on extensively and yet it was done in a great many of the large cities throughout this country, as far west as San Francisco. From this experiment we concluded that the difference in results yielded by the finger puncture and the venipuncture was not of enough difference to be of great consequence.

Secondly, we checked at that time the perfection of our laboratory technique in checking the results by Miss Hunt's Micro method, which, of course, is the ordinary Folin-Wu reducing method on a much smaller scale. We checked this method against the laboratory technique employing larger quantities of venous blood by the ordinary Folin-Wu, and there again we found that our laboratory reports were uniformly comparable. Our technician was also sent up to the Deaconess Hospital to work with Miss Hunt. While we learned from Miss Hunt that she had great difficulty in finding technicians who could get uniform results by this method, that there were only two or three of them that she could trust the procedure to; yet we found that our technician was obtaining very uniform and very accurate results when checked against Miss Hunt's best workers.

Based upon this field determination we decided that this method was satisfactory for our use and we still feel so. We still feel as Dr. Folin has pointed out, that while the sugar determinations are slightly lower by this method, and the cutaneous blood will yield slightly lower readings than venous blood, yet the

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difference is not of sufficient consequence to be of any great value.

We all individually, as we review the sugar problem, have to decide for ourselves as to what shall be the ordinary blood sugar content for the average individual according to the determination employed and the source of one's blood specimen. We have to determine what shall be the average ordinary blood sugar content in response to a glucose tolerance test. Laboratory workers will show a great variety in their opinions. One company may determine that .15 is the proper amount, or .16, and some will go as high as .19. I believe that whatever procedure you use, when you get up to blood sugar contents of over .19 you are entering a rating experimental stage that will require more than one blood sugar determination and perhaps some clinical study of the individual.

I did not say previously that of course we use sodium fluoride as a preservative of our specimens, out of the 362 that were mentioned, there were only 7 of them that were spoiled in transit—which I think was a very low figure. The average duration of time in this group of specimens from the point of collection to the arrival at the laboratory for determination was an average of 3.4 days. The longest interval of time with a perfectly satisfactory specimen was 12 days. There may be, of course, some debate as to the amount of sugar that still remains in such specimens, how much self-reduction could have gone on in that time; but if sufficient of the preservative is used, coagulation is prevented, putrefaction is retarded, and the sugar content is fairly well preserved.

Dr. Daley—Thank you. Dr. Exton.

Dr. Exton—Just as a matter of interest in connec-

tion with what Dr. Folin said with regard to the significance the peak of the sugar content may have, Dr. Sweeney of Dallas during the last year published in the Archives of Internal Medicine two very excellent papers in which he shows conclusively that the nature of the diet taken for a day or two prior to making the blood sugar test will materially influence the height of the blood sugar curve. Strangely enough, when the people are using a carbohydrate diet, the blood sugar goes up much less than when the people are fed fats and proteins.

Dr. Daley—That's very interesting. Curiously enough, no mention has been made of the state of a man's digestion at the time the man takes the test meal.

Dr. Daley—Dr. Streight.

Dr. Streight—Mr. President—The study which I have submitted, while not so comprehensive as many of us might desire, is an endeavor to reduce the ideal investigation to a practical working basis. We must not lose sight of the fact that our selection usually will be based upon one blood sugar study, and consequently we must retain certain safeguards. By observing the fasting blood sugar level and the level at one-half or one hour after the glucose and at the end of two hours, we are in a much better position to form a definite opinion as to the cause of the glycosuria.

One hundred grams of glucose appears to be the amount in most common use among the numerous investigators in this field, and, when given in four hundred to five hundred c. c. of lemonade or coffee, is not an unpalatable drink. This test should, if possible, be carried out in the morning before any food

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is taken. A fixed carbohydrate meal (Woodyatt), while it might serve our purpose, lacks convenience of administration; it is more difficult to regulate the amount of carbohydrate taken; and it requires more time.

If we are to gain the greatest amount of valuable material for a future mortality study, the type of blood sugar study and the amount of glucose administered should be as uniform as possible. The investigators engaged in the clinical study of glycosuria are looking to us for some contribution along this line.

The Canadian Life Insurance Officers Association has adopted, as a basis of study in cases of glycosuria, a scheme practically similar to that outlined in my paper.

I feel that we should exercise great caution in accepting these risks and not regard too literally the opinion of the blood chemist completing the study. The reports submitted in Chart V were all stated to be non-diabetic. They cannot be regarded as low threshold types. To what class do they belong? Will they develop Diabetes at a later date, or will they show a tendency to degenerative diseases? It is probable that they will not have an average expectancy.

Dr. Daley—Thank you. Dr. Exton usually has something to say on the examination of the urine and what he says has merit and value in it. I am going to ask Dr. Exton to just give us a few preliminary remarks in connection with his paper, which is printed, and you all have it in your hands.

Dr. Exton—Mr. President and Members of the Association: The M. I. B. Committee directs that results of microscopical examinations be reported in terms of

so many pus and blood cells per microscope field or so many casts per half ounce of urine, and those requirements predicate the existence of a quantitative system of urinary microscopy. Now, when one Company examines an applicant for insurance and reports casts or pus in the urine and next week another Company examines the same applicant and finds none, the Medical Director very conveniently assumes that the condition is an intermittent and not a constant one—and the laboratories get their alibis through the fact that they didn't examine the same specimen of urine. However, sometimes it happens that in the course of an examination parts of the same urine do get into two different laboratories and that similar discrepancies occur. When this happens, the laboratory that makes the findings looks down in a superior sort of way on the one that failed to find the casts and pus, and the laboratory that failed to find them says that the laboratory that made the findings would find pus or casts in anything. (Laughter.)

Now the thinking laboratory man knows better than that. Paraphrasing the old saying about the spirit being willing but the flesh weak, he knows that quantitative microscopic urinalysis may be perfect in theory but that the results are mostly illusory in practice, and proof of this has come in the form of communications from different members that have been received by the Chairman of the Urinary Impairment Committee. Now, it was in order to see what could be done to harmonize and make more uniform the reporting of the different Companies that we undertook in our laboratory an investigation of the whole subject, and we sent out questionnaires, which I have to thank all of you gentlemen for answering so carefully.

In the paper you will find comments on the different techniques given in the questionnaires, and I want to explain that what we did was simply this: We took normal urines and added blood cells to them and through a number of counts knew exactly how much blood or pus the urine specimens contained. To such samples we applied these different technics one after another with variations and judged the efficiency of such technics in two ways: One by the reproducing ability of the technic or the similarity of results we could get with it by examining the seven or eight different parts of the same specimen of urine. The other criterion was the ability of the technic to recover the actual number of cells that were known to be in the urine samples.

Now, I will cut this thing short by saying that no technique—and I was very much disappointed that even our own technique, which we thought was pretty good—showed itself capable of either reproducing or of giving anything like what a reasonable definition would say as to what a quantitative result meant. It showed us that some work was necessary of a constructive nature if we were ever going to get any system that would give us a chance to talk in the same language to one another of the results of microscopical urinalysis.

In the paper you will find that we have gone into the matter detail by detail, but I will only mention three points because they seem to me to have the greatest influence in the matter of quantitation and are new as far as I can ascertain. Just think, for instance, that among the different Companies some centrifuge 500 r. p. m. and some 3,000. Some claim to centrifuge more, but I refuse to give them credit for it. Some centrifuge a half minute and some fifteen minutes. I have looked

through all the literature and textbooks and failed to find any series of experiments designed to show or define what efficient centrifugation means. I think an efficient centrifugation is one that will bring down with the sediment 98 per cent or more of the microscopic objects in the urine without injuring the objects by packing or by causing pus cells and blood cells to lump or agglutinate.

We also found out that the standard type of centrifuge tube holds a sample which is about  $3\frac{1}{2}$  inches in height, and that we could get a better sediment by reducing the length of the sample and centrifuging only one-fourth of the time. So we made this little cup to enable us to centrifuge in that way and get a better sediment in a shorter time.

Now, there is another factor that I think militates more than probably any other one in making quantitative tests as far as microscopy is concerned, and that is extricating the sediment from the supernatant urine. By none of the techniques was it possible to do this without diluting the sediment to some extent with the supernatant urine. Either it dripped back along the sides of the tubes or if the pipette was used, the urine rushed into the pipette along with the sediment. This dilution factor is uncontrollable by present methods and defies all other attempts at quantitation.

Another factor is the mucus matter which is normally in urine and which in pathological and normal urine varies a great deal. Now, for instance, you might have two specimens having exactly the same number of casts in the urine and yet when you centrifuge them, you get one having a sediment of  $1/10$  of a cubic centimeter and the other one  $5/10$  of a cubic centimeter, and if you count the casts in the routine way, one would ap-

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parently have 5 times as many casts as the other. So that an essential feature for correct quantitation is to have a constant volume of sediment which will give you a constant urine concentration factor.

After making some experiments to determine the amount of sediment that we get, we found that 1/2 c. c. of sediment would do first rate. So now we have this little centrifuge cup marked at the 15 c. c. and 0.5 c. c. marks. Pour in the urine, centrifuge for a minute and then with a syringe pipette, as I call it, simply lift off the top 14 1/2 c. c. and the sediment then represents a constant urine concentration factor of 30.

Another feature of all the methods which seemed to make it impossible to get anything like quantitative results is the unevenness and thickness of the microscopic preparations on the slides. Owing to the differences in viscosity, owing to the differences in surface tension, owing to dilution effects, it was found impossible to get correct counts with or without cover glasses. To overcome that, we have simply changed the slide by providing a little trough in it 1/10 of a millimeter deep, and this insures having the same evenness of specimen and distribution of objects under all conditions no matter what your sediment is like.

Now, these three points cover all I am going to say about technique, but I want to say a word about the important matter of reporting. In the adopted report of the Committee on Urinary Impairments certain combinations of lenses are directed to be used in Rules 4 and 6, one to get the magnification and the other as a standard counting field. I suggest that it would be better and that more uniformity could be had by leaving it open to any individual to use whatever combination of lenses he wanted and by changing that stipulation

so as to make it that the combination used for counting should cover a certain definite area or contain a certain fixed volume. It would be a very easy matter then for everyone to look at their lenses and pick up the microscope makers catalogue and figure out for themselves the correct factor to use in order to bring their reports into line with the committee's requirements. The other point is possibly more important. As you know, we are directed to report pus and blood and epithelial cells as so many per field, which means so many per unit of surface area, and we are directed to report casts as so many per half ounce of urine, which means so many by unit of volume. Now there is an incongruity which should be cleared up, but all I am going to do now is to point out that this system or this scheme of doing microscopy with a constant volume of sediment and with a fixed slide content enables you to report in any way that you want. I certainly hope, however, that the Committee will consider changing its requirements so as to report cells and casts in the same way, and I hope they will come to the conclusion that the right way to do it is by volume because this will enable greater accuracy. (Applause.)

## QUANTITATIVE MICROSCOPIC URINALYSIS

WILLIAM G. EXTON, M. D.

*Director Prudential Laboratory*

The numerous queries and suggestions relating to the techniques of microscopic urinalysis received by the Chairman of the Committee on Urinary Impairments and the Proceedings of our association evidence a live and natural interest in securing better quantitative and more uniform reports of microscopical examinations of urine, and the present paper presents the results of a *de novo* investigation of the whole subject made in the Prudential laboratory with a view to establishing experimentally definite grounds for improvements in technique.

For the sake of clarity the material is divided into two parts. Part I reviews the methods currently practiced by the different company laboratories in relation to the report of the Committee on Urinary Impairments adopted in 1927 and to experimental checks which were made of the various manipulative details entering into the techniques of urinary microscopy. Part II presents step by step the details of a practicable procedure for microscopic urinalysis which experimentally has proven capable of yielding uniformly quantitative results and which requires for its performance even less time and trouble than the system hitherto employed in the Prudential laboratory.

## PART I

Information concerning the current practices of the different companies was obtained from answers to a questionnaire dealing with the various technical details involved in microscopical urinalysis, and I take this opportunity to acknowledge not only the hearty response of the member companies but also to express my sense of obligation for the generally complete and careful answers sent and especially to thank those who favored me with suggestions, opinions, experiences, and, in a few cases, personal demonstrations. In this respect it may be said that the present paper represents a real co-operative effort.

As our problem concerned only the details of equipment and manipulations, the questionnaire was framed to bring these out with the utmost simplicity and clearness.

## QUESTIONNAIRE

## A—Microscope:

1. Make of microscope?
2. Tube length employed?
3. Achromatic or apochromatic system?
4. Maker's designation of eyepieces used?
5. Maker's designation of objectives used?
6. Combination of eyepiece and objective used for 1/6 field?
7. Do you use the Euscope or binoculars?

## B—Sediment:

1. Quantity of urine centrifuged?
2. At what speed?
3. For how long?

4. Is all or only part of sediment examined?
5. Please give full details of your technic for sampling sediment and preparing slide.
6. Size of slide used?
7. Size of cover glass used?
8. Do you examine more than one slide? If so, how many?
9. How many fields do you cover with low power? With high power?
10. Have you experimented with any other methods? If so, please give details, etc.

It will be seen that the first part (A) of the questionnaire covers equipment and it develops the fact that over 95% of the laboratories are using achromatic systems of the standard American makes of microscopes. In this connection it may be remarked that it is particularly in the examination of unstained or colorless specimens, such as urinary sediments, that the apochromatic systems offer advantages which more than compensate for their increased cost.

The questions dealing with eyepieces and objectives were asked with special reference to the 4th and 6th rules of the adopted Committee report. Thus, Rule 4 directs a thorough examination with high and low power objectives and 10 power eyepiece "so that the total magnification is known in estimating the field," and Rule 6 prescribes as the standard field for counting blood, pus cells, etc., the 4 mm. objective with 6 power eyepiece. Between the 6 power and 10 power eyepieces there is not enough difference in magnification to make it worth while to change eyepieces because increased magnification can be more easily and better obtained by a change of objectives which involves only

a turn of the nose-piece, while changing eyepieces is much more troublesome, especially if a binocular microscope or Euscope be used.

The rules (4) to use a 10 power eyepiece "so that the total magnification is known" and (6) to use a 6 power eyepiece as the standard field for counting, seem to cause confusion, because it appears that eyepieces are in use among the different companies running all the way from 2 to 15 power while there is practical conformity in the employment of 16 and 4 mm. objectives, although a few companies use 8 mm. and a few oil immersion objectives as additional equipment.

Since it is just as easy to compute "the total magnification" given by one eyepiece as another there seems to be no good reason why the same eyepiece should not be used both "so that the total magnification is known" and for the "standard" field. Harmonizing Rules 4 and 6 so that both stipulate the same combination of eyepiece and objective would help much to advance uniformity in reporting.

In any consideration of uniformity in reporting results, the combination of eyepiece and objective by which blood, pus and casts are counted and reported as so many per field, is of serious importance, and in Rule 6 the Committee defines as the standard field for this purpose the combination of 6 power eyepiece and 4 mm. objective. Notwithstanding the clearness of this definition the questionnaires show that there is much diversity of practice among the different companies. In fact, a number of them state explicitly that the high power, *i. e.*, 4 mm. objective is only employed for "confirmation" or "verification." If all of the companies employ the same eyepiece and technic throughout (questionable if any two of

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them do) but differ only in the objectives they use for counting blood, pus, etc., it is certain that a *q* reported by the company which counts with the 4 mm. objective will have a very different meaning from that reported by a company which uses a 16 mm. objective for the same purpose, and that the company which counts with a 4 mm. objective will not report hematuria or pyuria because it sees only 4 red or 9 pus cells per field, while the company which counts with the 16 mm. objective sees in the same specimen 70 red or 160 pus cells per field, because the area covered by the 16 is more than eighteen times greater than that covered by the 4 mm. objective and 10 power eyepiece. The settlement of this particular detail of equipment would enable all of the companies to advance an essential step in securing uniformity of reporting.

On this point it may further be noted that for generations the text books on clinical pathology have recommended the 4 mm. objective for urinary microscopy and it is indisputable that the 4 mm. or a higher power objective is absolutely necessary for seeing structural and cytological details and that every microscope employed for urinalysis should carry a high power objective on its nose-piece.

Indispensable as it is, however, for seeing detail, the 4 mm. or higher power objective is not only unnecessary but disadvantageous and inexpedient for counting objects which can be easily identified with lower powers or less magnification. The higher the power of an objective the smaller is the field it covers, the shorter is its working distance, the less its penetration, the more finicky its focusing and the

greater its sensitiveness to cover glass or specimen thickness. The casts, blood, pus, and epithelial cells which we are interested in counting are distinguishable with a 16 mm. objective and 10 power eyepiece, and under the conditions of routine work counting can be done much more quickly and easily and I think more accurately with this combination because of the greater penetration of low power objectives and their ability to disclose objects lying in different planes which are much more likely to remain unseen with the higher powers.

On the theory that we are all tempted to do things in easier rather than in more difficult ways, the Committee might gain more conformity by changing Rule 6 so as to make the standard field for counting that covered by the 16 mm. objective and 10 power eyepiece. If it should happen that some who try this combination for counting find that it does not afford sufficient magnification, the 8 mm. objective will prove a satisfactory compromise. We have found it extremely useful for urine work because it gives magnifications intermediate between the 16 and 4 mm. objectives and is much easier to work with than the 4 mm. objective.

Still another and better way to uniformity in reporting is open. It has the great advantage of permitting anyone to use whatever microscopic equipment he may prefer and nevertheless be able to report findings uniformly and comparably with others. Such a plan would merely require a slight change in the wording of Rule 6. Thus, instead of defining the standard field for counting in terms of a particular combination of eyepiece and objective, the Committee might stipulate that the standard field should have a

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certain diameter or cover a definite area or contain a fixed volume. Then anyone who desired to count with a 16 or 8 mm. objective need only divide the number counted by a correction factor in order to have its reports comparable with those who count with the combination directed by the Committee. As an example the Prudential laboratory employs apochromatic systems and counts with an 8 mm. objective and 15 power eyepiece. The field covered by this combination is between two and three times the area of the field covered by the 10 power eyepiece and 4 mm. achromatic system. In reporting, however, we always divide our counts by  $2\frac{1}{2}$  in order to bring our results strictly into line with the Committee's rule. Microscope manufacturers will readily supply information concerning the areas covered by their lenses and the simplest kind of calculation will enable any individual using whatever equipment he prefers to report his findings uniformly with others. In this way a real step in advance may be taken towards eliminating the discrepancies which so often occur when parts of the same specimen are examined in different laboratories.

The second part (B) of the questionnaire covers the manipulative and other details applied to examining and reporting counts of red blood, pus and epithelial cells and casts in specimens of urine. In general, it may be said that the answers to the questionnaires expose a very disconcerting diversity of laboratory practice. In fact, the answers indicate that it is doubtful if any two companies make microscopical examinations of urine in exactly the same way.

As the questionnaires were received they were reviewed and roughly classified as to general technical

design with special reference to sensitiveness and quantitative accuracy. As an illustration, one company examines the sediment of 120 cc. of urine and another that of only 5 cc. If both of these companies received the same urine and examined the entire sediment, as some of the companies do, one would report 100 pus cells per field while the other would not report pyuria or the presence of pus at all, *i. e.*, only 4 per field, because the technic of one company is twenty-five times more sensitive than that of the other. On the other hand, when 5 and 120 cc. samples of the same urine are treated differently following details actually given in the questionnaires, the 5 cc. sample often yields more sensitive or positive results than the 4 ounce sample, or twenty-five times more urine.

From this it will be seen that the problem of defining a microscopic procedure capable of giving uniform and quantitative results was only to be solved by checking step by step with one another the various technical procedures delineated by the answers given in the different questionnaires. To these were added, in order to make our investigation as complete as possible, other techniques found in the text books and literature such as those of Addis<sup>1</sup>, Ockerblad<sup>2</sup>, Heitzman<sup>3</sup> and others.

To guide our experimental study and for the sake of clarity and convenience all of the various manipulative details involved in urinary microscopy were listed *seriatim*. From the list it is apparent that they separate naturally into two distinct types, sampling and microscopy.

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**SAMPLING**

Sampling the urine

Sedimenting the urine

Sampling the sediment (microscopic specimen)

**MICROSCOPY**

Preparing the specimen

Examining the specimen

Reporting the findings

It will also be noted that each step on the above list connotes the performance of several distinct technical details and that in order to obtain essential data for comparing with and checking against one another all of the different techniques outlined in the literature and questionnaires comprised in our program, it was obligatory to perform the same technical step many times and in various ways. From this it will be understood that it would bring this paper to an inordinate, in fact impossible, length were the attempt made to fully set forth all of the protocols accumulated in the course of the work, and our presentation of data must, therefore, be limited to a form of summary or illustration when commenting on particular technical details.

**SAMPLING THE URINE**

If it is intended to examine the urine immediately after voiding or if the design be to sediment by gravity, no mixing is required. In all other instances the whole amount of urine voided should be *well mixed* before a sample is taken for examination or for

mailing to the home office. As sampling is a very frequent pitfall of error, it will pay to thoroughly instruct and remind examiners on this point.

Specimens received in the laboratory should be cleared as far as possible of interfering suspended matter like urates, etc., before the sample to be examined is taken. The importance of thorough mixing before sampling is experimentally demonstrable by the differences of thousands percent found by examining different portions of the same insufficiently mixed urine, and it is of course true that every other attempt to quantitate will be vitiated if the sample be not a true or representative one.

To insure thorough mixing we have found no other method as satisfactory as gently turning the bottle upside down five or six times, and it is particularly noteworthy that violent agitation is not only unnecessary but positively harmful because it helps to dissolve casts and otherwise damage objects which we intend to study under the microscope.

The questionnaires indicate that almost all of the companies sample 15 cc. of urine. A few sample 10 cc. and a few only 5 cc. On the other hand, one company samples two ounces or twelve times more, and another company samples 4 ounces, making a twenty-five fold variation in the amount of urine sampled for microscopy by the different companies. In this connection it may be noted that a long line of related experiments show that the amount of the urine sample is relatively unimportant and that no particular advantage accrues from sampling larger amounts than the usual 15 cc. utilized by more than 80% of the companies. It is the efficiency of sampling and subsequent technique of handling rather than the amount

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of sample taken which determine the sensitiveness and quantitative accuracy of the final results.

SEDIMENTING THE URINE

The questionnaires develop the fact that only one company relies on gravity alone and that all the others depend more or less upon the centrifuge for sedimenting urine. Three companies, however, allow the urine to stand for a time to sediment by gravity before centrifuging a sample selected from the bottom layers.

There has been some controversy over the relative merits of sedimenting urine by gravity or by centrifuge which has centered chiefly on statements made by some authorities in text books and discussions to the effect that rapid centrifugalization deforms and injures fragile objects like leucocytes and casts. This is an important matter and one which unfortunately does not lend itself to illustration by experimental proof. I have, however, on numerous occasions sedimented by gravity and by centrifuge (2000 to 3000 r. p. m.) urines containing not only blood, pus and epithelial cells but also urines containing more fragile objects like waxy and fatty casts and fatty and hyaline detritus and compared them under the microscope. From what I have seen I feel convinced that centrifugal speed within such limits as I have used it does not injure or deform these objects, unless centrifugalization be unduly prolonged. In this case violence is done by the packing of the sediment which takes place, and insult is added to injury in the process of extricating part of the sediment for examination.

Another disturbing force which may injure delicate objects comes into play during deceleration which Rule 1 of the Committee specifically warns us to be careful about, and still other injurious forces are exerted in pouring off the supernatant urine or part of the sediment. During deceleration and pouring eddies form which produce torques that exert unequal forces and thus tend to injure the microscopic objects by twisting them. On the other hand, centrifugal force is constant, steady and evenly distributed and therefore much less likely to injure delicate objects.

By avoiding unnecessarily prolonged centrifuging in order to prevent packing the sediment and by decelerating smoothly a better conditioned sediment can actually be had with the centrifuge than by gravity, and on the score of injury to microscopic objects gravity as a method of sedimentation offers no advantages over centrifugalization.

The only other advantage which preliminary sedimentation by gravity might be conjectured to offer is sensitiveness, and on this point the methods given in the questionnaires were checked experimentally.

To illustrate, we can use what appeared to be the most sensitive procedure found in the questionnaires which was described as follows: "We plan to have a 4 oz. specimen. This is allowed to stand for at least one hour and the top three-fourths or four-fifths is poured off. 15 cc. of the remainder is centrifuged for three minutes at 1050 r. p. m." The efficiency of this procedure was tested by carefully performing every detail of the technic on a specimen of normal urine to which fresh blood from a finger prick had been added. Hemacytometer counts showed that the 120 cc. specimen contained 244,800,000 red cells.

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This specimen was allowed to stand an hour, sedimenting by gravity, and then the upper three-fourths, or 90 cc., were poured off and 15 cc., or half of the remainder, was centrifuged for three minutes at 1100 r. p. m. Hemacytometer counts then showed that the red cell content of the sediment was only 17,612,000, indicating a recovery of only about 60% of the actual number of red cells in the 15 cc. sample. This result was checked by the more sensitive criterion of counting the red cells in the urine above the sediment, and it was found that both counts agreed within experimental error, and correlative experiments indicate that the effect of an hour's preliminary sedimentation by gravity is negligible in its effects on sensitivity.

The questionnaires reveal that some laboratories underdo and some laboratories overdo centrifuging. Thus one laboratory centrifuges only one minute while several centrifuge 15 minutes, and all of the intervals between these are represented in the methods used by the different laboratories. Similarly, the different laboratories centrifuge urine at different speeds ranging from 500 to 3,000 r. p. m. with various r. p. m. in between the extremes practiced by one or more of the companies.

It is curious indeed to find so much inefficiency and such wide variations in the performance of a routine technical detail, because after all the shaping of an adequate or efficient sedimentation technic is a matter of mathematics and mechanics which easily lends itself to experimental proof.

Fourteen years ago I centrifuged urines containing casts and red and white blood cells at different r. p. ms. for different intervals of time in order to

determine the time and speed factors necessary to bring 90% or more of the microscopic objects in urine down into the sediment, and as a result the standard sedimentation technic of the Prudential laboratory has since then been to centrifuge urine for four minutes at 2000 r. p. m. This technic employs the usual 15 cc. centrifuge tube and has proven efficient and does very little, if any, injury to the microscopic objects. These early experiments have been rechecked during the course of the present investigation, and as illustrations, the results of centrifuging experiments on amounts of samples such as the different companies employ are given in the following tables:

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 CENTRIFUGING EXPERIMENTS

TABLE 1

Effects on 5 cc. Urine Samples

Sample A = 100 cc. normal urine + 0.1 cc. fresh blood  
 containing 3,920,000 red cells per c. m. m.

Minutes at 2000 r. p. m.	Found in Sediment	Found in Super- natant Urine
1	CF*	200
2	CF	80
3	CF	44
4	CF	36

\* CF = cover the microscope field.

Sample B = 100 cc. normal urine + 1 cc. Sample A.

1	84	16
2	84	0
3	96	0
4	108	0

TABLE 2

Effects on 10 cc. Urine Samples

Sample A = 100 cc. normal urine + 0.1 cc. fresh blood  
 containing 4,780,000 red cells per c. m. m.

Minutes at 2000 r. p. m.	Found in Sediment	Found in Super- natant Urine
1	14,240	432
2	CF	248
3	CF	56
4	CF	40

Sample B = 100 cc. normal urine + 1 cc. Sample A

1	432	108
2	520	68
3	560	8
4	960	0

TABLE 3

## Effects on 15 cc. Urine Samples

Sample A = 100 cc. normal urine + 0.1 cc. fresh blood  
containing 4,860,000 red cells per c. m. m.

Minutes at 2,000 r. p. m.	In sediment		In supernatant	
	In sediment by hemacytometer	per H. P. field by usual technic	In super- natant urine by hemacytometer	urine per H. P. field by usual technic
1	24,400	150	13,600	55
2	46,400	200	2,400	---
3	CF	200	1,600	11
4	CF	200	410	225

Sample B = 100 cc. normal urine + 0.1 cc. Sample A

1	260	3	410	2
2	308	4	100	---
3	350	9	80	1
4	510	7	56	1

TABLE 4

## The Effect of Centrifuging Urine Samples from Hematuria and Pyuria Cases

*Hematuria*

Minutes at 2000 r. p. m.	Cells per cc. Remaining in Supernatant Urine	Percentage of Removal
0	1,360,000	---
2	160,000	89.1
3	20,000	98.5
4	----	100.0

*Pyuria*

0	490,000	----
2	60,000	87.8
3	45,000	89.8
4	10,000	98.0
5	----	100.0

From the data given in these tables it is evident that 15 cc. urine samples in the usual type of centrifuge tube, which practically all laboratories employ, are efficiently and adequately sedimented by centrifuging four minutes at 2000 r. p. m.

Those who for one or another reason may prefer to centrifuge at greater or lesser speeds than 2000 r. p. m. should experimentally determine the correct time factor for the speed they desire to employ, taking the precaution, however, to centrifuge long enough to bring to the sediment 98% or more of the microscopic objects and to avoid injuring the sediment by unnecessarily prolonged centrifugalization.

All of the experiments shown in the tables were carried out with the standard laboratory type of 15 cc. centrifuge tube and the marked differences in the results obtained by centrifuging different quantities of urine, i. e., 5, 10 and 15 c. c., will not have escaped attention. At first sight it does not strike one as being surprising to find that smaller quantities sediment quicker than larger quantities, but it happens that it would be a mistake to attribute differences such as these merely to the quantity or volume of the sample because in the standard 15 cc. centrifuge tube the samples stand at different heights or vary in length according to their quantity. Thus a 5 cc. sample is 53 mm., a 10 cc. sample is 80 mm., and a 15 cc. sample 110 mm. long.

To determine the effect of length of sample on centrifuging, three tubes of different bore and shape were selected. As a matter of convenience these were standard types of centrifuge tubes designed to hold different quantities of sample, i. e., a 50 cc. tube having a bore at the mouth with a diameter of 27 mm., a

30 cc. tube with a diameter of 26 mm. at its mouth, and a 15 cc. tube having a diameter of 14 mm. Into each of the three tubes 15 cc. of the same urine containing red blood cells was poured, and the lengths of the standing samples measured. In the 50 cc. tube the urine sample measured 31 mm.; in the 30 cc. tube 62 mm.; and in the 15 cc. tube 95 mm. The samples were then centrifuged for different periods of time at 2000 r. p. m. and the red cells were recovered from the supernatant urine by centrifuging for ten minutes at 2000 r. p. m. and then were counted.

TABLE 5

Effect of length of sample on centrifugation

Minutes centrifuged at 2000 R. P. M.	Length of sample	Cells in supernatant urine
1	31 mm.	65,000
	62 mm.	120,000
	95 mm.	430,000
2	31 mm.	0
	62 mm.	90,000
	95 mm.	130,000
3	31 mm.	0
	62 mm.	20,000
	95 mm.	56,000
4	31 mm.	0
	62 mm.	0
	95 mm.	20,000

The data in this table strongly suggests a picture of sedimentation which shows the microscopic objects

lying in different layers piled on top of one another. Thus, the time factor for efficient centrifuging does not depend upon the quantity of a sample but upon its length. It is in fact the time it takes to bring the topmost layers of microscopic objects in the sample down into the sediment. Correlative experiments indicate that increasing the time factor by centrifuging at low speeds tends to irregularities in results and to injury of the microscopic objects by packing and other forces.

The data in table 5 also point to the possibility of improving sedimentation techniques by employing centrifuge tubes better designed for sedimenting urine than the standard 15 cc. tube. By using shorter tubes it will be possible to save time in operation, increase the life of the centrifuge and get better conditioned sediments.

#### SAMPLING THE SEDIMENT (MICROSCOPIC SPECIMEN)

After getting a proper sediment by efficient centrifuging the next step is to sample it so as to get a good and true microscopic preparation. In order to estimate the efficiency or quantitative accuracy of the many and various techniques given in the literature and questionnaires for performing this step, I adopted as a criteria the reproducibility of results obtainable by repeating the same procedure on portions of the same specimen of urine and the recovery of the actual known content of the sample.

The first detail of this step involves extricating the sediment from the urine which lies above it. The great majority of laboratories simply pour this off. Some, however, get a part of the sediment through a pipette. Repeated according to the many and vari-

ous ways outlined in the questionnaires and with different kinds of pipettes, it was found that neither method, no matter how carefully performed, is capable of giving results which are even remotely reproducible. From specimens which are poor in mucus or binding material for the sediment, such as low gravity or interstitial nephritis urines, casts are just as apt to be entirely lost by one method as by the other and, it may be remarked, just when it is most important to find them. Furthermore, it is impossible to perform either method in such a way as to avoid diluting the sediment with some of the supernatant urine, which in one case drips back from the sides of the tube and in the other case cannot be prevented from entering into the pipette. In either case such unavoidable dilutions represent uncontrollable and inconstant factors which operate to invalidate all the other efforts which one may make to quantitate accurately.

It is also to be remembered that urines contain variable amounts of mucoid substances which act as a binding material for the sediment and that the amount of this binding material, except in rare instances, determines the volume of the sediment obtained by centrifuging. The amount of this mucoid binding material varies enormously in normal as well as pathological urines and therefore constitutes another serious factor in destroying the effects of other attempts at accurate quantitation. To illustrate, we may take the two specimens which come from Mr. X and Mr. Y. Both contain the same number of casts per cc. of urine. Mr. X's specimen is poor in binding material and when centrifuged yields only  $1/10$  cc. of sediment. Mr. Y's specimen is richer in mucoid matter, and when similarly centrifuged yields  $5/10$  cc., or five times more

sediment. Naturally, when similar parts of the specimens from Messrs. X's and Y's urines are examined under the microscope, Mr. X suffers an injustice by being compared with Mr. Y because if counted with equal efficiency, the reports will show that Mr. X's urine contains five times as many casts as Mr. Y's. In fact, it must often happen that persistent casts are reported on specimens like X's while those like Y's are reported negative for casts when in reality their urines contain exactly the same number of casts. It is therefore necessary to regard the mucoid material which is present in urine in the same light and as similarly causing the same disastrous effects on quantitative accuracy as the unavoidable dilution of the sediment which takes place with present methods of extricating it from the supernatant urine.

The only way I have been able to find to minimize effectually these serious causes of error is to scratch mark the circumference of the centrifuge tubes at some definite level so that the same volume of sediment or sediment plus urine will always be taken as the measure of the content of microscopic objects in samples of urine. To determine this amount, 15 cc. of each of one hundred consecutive specimens having a gravity of 1020 or higher were centrifuged for four minutes at 2000 r. p. m. as they came into the laboratory and the amounts of the sediments obtained in this way were measured.

TABLE 6

Amounts of sediments obtained by centrifuging 100 specimens of urine at 2000 r. p. m. for four minutes.

No. of specimens	Quantity of sediment
15	Less than 0.1 cc.
19	" " 0.2 cc.
32	" " 0.3 cc.
31	" " 0.4 cc.
2	" " 0.5 cc.
1	" " 0.6 cc.

From this it appears that for a 15 cc. sample of urine centrifuged in the usual tube it would be practicable to take 5/10 of a cc. of sediment or sediment plus urine as a volume constant. This represents a concentration factor of 30. For the rare specimens which yield over 5/10 of a cc. of sediment it will occasion no difficulty to take 1 cc. as the volume constant and maintain the same concentration relation by multiplying results by two.

Having now a sediment of constant volume the next manipulation in order concerns getting a satisfactory sample of it on the microscope slide. Here again the questionnaires and literature indicate a rich variety of means by which a routine technical step is performed in different laboratories. For convenience of comment they may grossly be divided into those who attempt to examine all of the sediment and the majority, who are content to examine a sample of the sediment. Those who intend to examine all of the sediment transfer it to a slide in one of three different ways. They introduce a pipette through the supernatant urine or decant the supernatant urine and then

pour the sediment on a slide or transfer it with a pipette. When these methods were tried out exactly as described and with different kinds of pipettes managed in different ways, it was found impossible to get all of the sediment on the slide by any of them. The texture of the sediment, its viscosity and surface tension, to say nothing of numerous extraneous factors like dilution and loss on glass surfaces, prevent this operation being carried out with a reasonable degree of uniformity or accuracy by any of the methods described. Other elements of inaccuracy present themselves when it comes to making microscopic preparations of the total sediments of 15 cc. urine samples.

Those who are content to sample sediments employ different kinds of pipettes in various ways for the purpose and many following rule 2, specifically mention capillary pipettes. I have tried hard to find out what particular advantages capillarity or capillary pipettes afford in sampling urine sediments, and after seeing some of the pipettes in use and reading the descriptions of the ways they are used I am unable to come to any other conclusion than that on this point there is very much misunderstanding and confusion. The word capillary comes from the Latin *capillus* meaning hair, and glass blowers tell me that to them a capillary pipette means one whose walls are very thick in proportion to the bore, and that such pipettes are less sensitive to temperature changes and therefore more accurate for volumetric measurements. They are also more expensive because they are usually calibrated more carefully in finer graduations. From what I can learn, the capillary pipettes alluded to in the questionnaires do not seem to be of this type. Glass tubes with hairlike bores are sometimes called capillary

pipettes because in a restricted way mobile liquids will rise in such tubes by capillary attraction. Of these hairlike bore tubes it may be said that the viscosity of urinary sediments nullifies whatever capillary attraction they may possess for more mobile liquids, and that they are positively disadvantageous for handling urinary sediments because the narrowness of their bores, particularly at the tip, tends to break up casts and organized detritus which may be in the sediment. They also lead to selectivity in sampling. Therefore, 2 mm. might well be regarded as a minimum diameter for the bore of pipettes designed for handling urinary sediments.

If one introduces a pipette or any other kind of a hollow tube, open at the ends, into a vessel containing a mobile liquid, it will be seen that the liquid rises in the tube up to a level even with or a little higher than the liquid in the vessel. All of the liquid which rises in the tube up to the level of the surrounding liquid gets there by virtue of hydrostatic balance, or weight of the surrounding liquid. Only that part of the liquid in the tube which may rise above the level of the surrounding liquid can be accounted for by capillarity, and this weak and variable force is not even brought into play in handling urinary sediments. The techniques which get the sediment up by introducing a pipette with upper end closed through the supernatant urine until the tip is in contact with the sediment depend upon the rush of urine into the pipette when the pressure of the finger is released to carry along the sediment with it, and not at all upon capillary forces.

From the above necessarily scant discussion it is evident that capillarity or capillary pipettes play no part at all and may even be disadvantageous in

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sampling urinary sediments. In our experience in handling urinary sediments nothing has occurred to indicate that suction is in any way more disadvantageous than other forces which are brought into play by the different technics recorded in the questionnaires. In fact, suction has possibilities of substantial usefulness. The real point seems to be that only mild forces should be used in handling urinary sediments and that all forms of violence must be avoided.

With techniques otherwise satisfactory the two greatest pitfalls of error in quantitative urinary microscopy are sampling the urine, which has already been discussed, and sampling the sediment. The techniques of the twenty companies who regularly examine all of the sediment are evidently designed to eliminate the uncertainties involved in sampling the sediment. With a view to establishing their reproducibility, these techniques were first practiced and then performed according to the details given in the questionnaires, although more time than these indicated was devoted to microscopy. These techniques were repeated with every possible precaution to insure uniformity on samples of the same thoroughly mixed urine containing pus cells and casts, and none of them was found to give results which came within a reasonable definition of reproducibility.

All of the other laboratories seem to be content to sample the sediment, although the amounts of sediment taken for examination differ among them. Some answers to the questionnaire emphasize the importance of mixing the sediment before the sample is taken, and in our work it was assumed that all laboratories take the precaution to thoroughly mix the sediment before taking the sample for microscopy, although a large

proportion of the answers did not mention this essential point, probably because the questionnaire did not specifically ask about it. The remaining companies follow rule 2 by taking samples "from the top, middle and bottom of the sediment with a pipette" and mixing them on a slide. These two methods were checked experimentally and it was found that mixing the whole sediment before sampling gives better reproducibility than attempts to sample the sediment by layers and then mix. In fact, the results were so overwhelmingly in favor of mixing the whole sediment before selecting the sample that it would be advisable to discourage attempts to pick up parts of the different layers in the sediment and then mix them.

Thus, urine containing blood cells was centrifuged and samples selected both by picking "representative samples from the top, middle and bottom of the sediment" and by mixing the whole sediment before selecting the sample. The average deviation between counts of eleven samples selected by the layer technic was 15.5% while the average deviation of the samples selected from the mixed whole sediment was 5.3%.

The only detail concerned with sampling the sediment which remains to be considered is the method of mixing the sediment. Some stir it with a rod, some tap, some rotate and some shake the tube, others blow the sediment in and out of a pipette or jiggle the pipette up and down in the sediment. When these methods are checked against one another, no great differences are apparent, but the results distinctly favor the last two methods and this finding is corroborated by the whirling currents set up by the other methods which can be clearly seen to cause the microscopic objects to gravitate away from the periphery

and form a thin revolving column in the center of the tube.

#### MICROSCOPY

##### Preparing the Specimen

With the exception of those who examine multiple specimens on the same slide and some of those who examine all of the sediment, the questionnaires reveal that all of the laboratories employ 3 by 1 inch slides, and these may, therefore, be considered standard.

Some laboratories did not answer the question about cover glasses. Of those who did, twelve, principally those who attempt to examine all of the sediment, do not, and sixty-four always use them. On this point it is worthy of comment that every optical and many practical considerations render the use of cover glasses distinctly advantageous.

Those who do not employ cover glasses may be separated into those who examine all of the sediment, and must, therefore, allow the thickness and evenness of the microscopic preparation to depend entirely on accidental variables like surface tension and viscosity, and those who try to get an even distribution of the sediment by smearing it on the slide. Those who use cover glasses try to get an even layer of sediment for examination under the microscope by manipulating them in various ways. In checking these methods against one another experimentally in addition to reproducibility of results obtainable, two other criteria of efficiency were employed, *i. e.*, ease of focusing or having all of the microscopic objects as nearly as possible in the same plane, which is very important in all count-

ing methods, and uniformity in the distribution of the microscopic objects in different parts of the same preparation. For each of these criteria a summary of the results shows the superiority of cover glass preparations.

Trials with different methods for making cover glass preparations, however, also proved disappointing, principally because the nature of the sediment prevents making spreads of uniform thickness and differences in thickness lead to differences in counts which easily run into the hundreds per cent. The results of trying and checking all of the various ways of making microscopic preparations of urinary sediments pointed to but one, and that a very discouraging conclusion for those interested in quantitative microscopy, because it was found impossible to reproduce counts satisfactorily by any of the routine methods of making microscopic preparations.

The blood cell counting chamber has been used and recommended by Addis<sup>1</sup> for counting casts, etc., in sediments and by other workers for counting blood and pus cells in uncentrifuged urine, and it is undoubtedly the most accurate and practical means for counting microscopic objects now available. It was therefore used extensively for control as well as experimental purposes throughout our investigation, and hundreds of counts on sediments and urine were made which helped us to acquire an unusually rich experience in the technique of counting.

When the inefficiency and quantitative unreliability of current routine methods for making microscopic preparations were brought to light by the experimental work, the practicability of using the blood counter for routine work naturally came into consideration and

was thoroughly tried out. In the course of this study it was seen that the blood counter did not work as well for sediments as it does for more mobile materials like urine and diluted blood. In fact, the difficulty of getting good preparations with some sediments and also other irregularities inherent in filling a capillary cell with viscous material became plainly evident.

The blood counter has other features which I think also do not make it adaptable to urinalysis such as the rulings, which are disturbing but account for much of its cost, and its unnecessarily inadequate surface area of only 1/400 sq. mm.

To surmount these disadvantages an experimental counting chamber was constructed which is nothing more or less than a standard 3 by 1 inch slide having in its middle a 400 mm. square trough 1/10 mm. deep. It may, therefore, be referred to as the trough slide. To fill the trough one simply places a sample of sediment in it and presses a 0.5 mm. thick and 25 mm. square cover glass down around the rim of the trough. This takes no more time or trouble than current methods of preparing specimens but gives us always a microscopic specimen of constant volume, and thinness of layer with remarkably even distribution of the microscopic objects. Table 7 shows the correspondence of samples taken of the same sediment and urine when counts were made by two workers with the blood counter and trough slide.

TABLE 7

Trough cell and routine technique compared with hemacytometer counts

Spec. No.	Per c. c. centrifuged		per c. c. uncentrifuged		Hema- cytometer	Routine
	Trough	Hemacytometer	Trough	Hemacytometer		
1—pus	3,600,000	4,000,000	210,000	140,000	60-70	
2—pus	1,140,000	1,040,000	144,000	95,000	30-40	
3—pus	300,000	210,000	24,000	10,000	8-10	
4—casts	48,000	50,000	1,245	2,500	numerous	
5—pus	1,950,000	1,600,000	109,500	85,000	?	
6—pus	3,000,000	3,240,000	75,000	27,000	—	
7—pus	2,200,000	2,064,000	15,000	17,500	80-90	
8—pus	1,066,000	1,080,000	24,000	23,000	10-12	
9—pus	2,360,000	2,510,000	96,000	58,000	40-50	
10—blood & pus	628,000 1,052,000	720,000 1,412,000	60,000 111,000	70,000 100,000	10-12 15-20	
11—pus	3,320,000	3,090,000	99,000	74,000	30-40	
12—pus	8,260,000	9,032,000	207,000	233,000	60-70	
13—pus	921,000	822,500	31,200	25,000	15-20	
14—casts	117,000	117,000	21,500	16,600	many per slide	

Another existing type of counting chamber designed for counting molds was later called to my attention, and Table 8 shows the results of comparing this with the blood counter.

TABLE 8

Mold cell and routine technique compared with hemacytometer counts

Spec. No.	Per c. c. centrifuged		per c. c. uncentrifuged		Routine per H. P. field
	Mold	Hema- cytometer	Mold	Hema- cytometer	
1—blood	2,920,000	2,560,000	432,000	326,000	15-20
2—pus	5,760,000	12,000,000	375,000	275,000	C. F.
3—pus	1,062,000	1,210,000	147,600	100,000	80-90
4—pus	2,400,000	2,880,000	313,200	360,000	—
5—pus	720,000	960,000	360,000	420,000	C. F.

From the data it is evident that results which are quantitative to a degree unattainable by other methods can be had with either of these devices.

## EXAMINING THE SPECIMEN

According to the questionnaires, one company tries to examine the entire sediment with both low and high powers, and only rarely are more fields covered with the high power than with the low power. Some cover the same selected fields with both high and low powers but the majority employ high powers only "rarely," "casually," "when needed," "for confirmation," etc. The number of fields regularly examined run all the way from "several" or five to more than a hundred.

In order to lose no unnecessary time on negative ones experienced microscopists generally begin their examination of a specimen by carefully but rapidly searching through a number of low power fields. Some such combination as 16 mm. objective and 10 power eyepiece giving a magnification of 100 or more suffices for this purpose, and the greater areas covered by low power objectives enable the microscopist to avoid wasting time and tedium over specimens which contain nothing of interest. In his searching the experienced microscopist, if he sees anything which is not clearly and unquestionably distinguishable or recognizable will resolve it by switching on the high power objective. The technician-microscopist if he has any doubt at all about the identity or significance of an object thus resolved, is in duty bound to show it to the Director of the laboratory, who it is assumed, is a pathologist. Technicians should be continually reminded that the principal virtues of a microscopist are keenness and discrimination in spotting unusual and unfamiliar objects and honesty and accuracy in counting objects which have to be counted when they

are present in the specimens. Counting objects like casts and pus cells in unstained specimens is tedious work and the use of higher magnifications than are necessary for comfortably resolving and clearly distinguishing the objects which have to be counted tends to diminish accuracy because of the optical restrictions imposed by higher powers. Similarly operative as another deterrent to accuracy is thickness of the specimen which makes it necessary to focus on objects lying in different planes.

#### REPORTING THE FINDINGS

The questionnaire discloses that only about twenty laboratories make any pretense at all of trying to follow rule 5 and report casts "by number in one-half ounce of urine," and these are the laboratories which try to examine all of the sediment and therefore count the larger numbers of fields. The majority who examine only a sample of the sediment report in terms of number of casts per slide on the basis of what may be found in examining 15-30 of the 4500 high power fields included under a 7/8 inch cover glass.

Besides this discrepancy, some of the questionnaires comment upon the "incongruity," as it was called, of reporting cells by surface areas or per microscope field and casts by volume of urine, as directed by rule 5.

It has occurred to me that it might be practicable to harmonize the companies who report on the basis of casts per half ounce of urine with the rest of the companies who report in terms of casts per slide by changing rule 5 so as to require that casts be reported like blood and pus cells as so many per microscopic field, with a plus sign attached to the number when one or more casts are found per field and a minus

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sign when less than one cast per field is found. Thus, a finding of three casts per field would be reported plus 3 and a finding of one cast in three fields would be reported minus 3.

If such a scheme of reporting be considered impracticable, it may be suggested that the trough slide makes it very easy and convenient to report all of the objects which interest us in the same terms, whether by surface area or by volume.

In this connection it may be pointed out that reports in terms of content per volume of urine admit of far greater accuracy than reporting in terms of surface area like so many per field or slide, and that it would also be advantageous to bring all counts into line with hemacytometer counts, *i. e.*, per cubic millimeter of urine. There would also be an advantage in giving the word negative, so commonly used to describe urine specimens, a specific meaning. Judging from the answers to the questionnaires, twenty times the surface area covered by the 16 mm. objective and 10 power eyepiece; or 40 sq. mm. appears to be a definition that would prove acceptable to all of the companies for reports made in terms of surface area. A negative specimen would then be defined as one which showed no casts and not enough cellular elements worth while counting in 40 square mm. of surface area or 20 low power fields (16 mm. objective and 10 power eyepiece).

PART II

Based on the information given in the questionnaires and literature and on the experimental data outlined in Part I of this paper, a system of urinary microscopy has been developed which offers the following advantages:

It enables uniformity in reporting.

It is quicker and easier to perform than current methods.

It is sensitive enough for every conceivable purpose.

It is quantitatively accurate, *i. e.*, averages within 10% experimental error.

To facilitate quick and easy performance of the procedure three small pieces of apparatus (glassware) have been specially designed; a centrifuge tube, a syringe pipette, and a trough slide.

The dimensions of the centrifuge tube conform with our experimental data, and its contour follows as closely as possible present good models of centrifuge tubes. The new tube is marked at levels indicating contents of 0.5 and 15 cc., and its bore is such that the distance which the objects in the topmost layers of the urine must fall to be included in the sediment is only 25 mm. Its lower end is cupped to avoid disturbance of the 0.5 cc. of sediment, which represents a volume constant, with urine concentration factor of 30.

The syringe pipette is designed for sampling the sediment contained in the special centrifuge tube. Its tip has a bore of 2 mm. and its lower part is a 4 cm. long glass tube. The upper 5 cm. is dilated and shaped on the end to fit a rubber bulb.

The trough slide comes in two models, one for single specimens and one which holds eight specimens. The single specimen 3 x 1 slide has in its middle an area of 400 sq. mm., which is 1/10 of a mm. deeper than the surrounding glass. The multiple slide holds eight sediments. Each trough is numbered and surrounded by provisions for catching overflow and preventing mixing or contamination of one specimen by another.

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sign when less than one cast per field is found. Thus, a finding of three casts per field would be reported plus 3 and a finding of one cast in three fields would be reported minus 3.

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With this equipment the procedure is carried out as follows:

1. Mix the urine by turning the bottle slowly and gently upside down a few times.
2. Pour the sample into the centrifuge tube up to the 15 cc. mark.
3. Centrifuge one minute at 2000 r. p. m. taking care to decelerate smoothly.
4. Lift off the upper 14.5 cc. of urine with the syringe pipette.
5. Thoroughly mix the remaining 0.5 cc. of sediment or sediment plus urine by jiggling the pipette up and down.
6. With the pipette transfer a drop or two of sediment to the trough of the slide.
7. Press the 0.5 mm. thick cover glass down around the rim of the trough.
8. Place the slide under the microscope and look through 20 low power fields. If nothing significant is seen, the specimen may be called negative.

The distribution of microscopic objects in trough slide preparations will be found surprisingly even which facilitates counting and makes it possible to attain accuracy by counting a lesser number of fields than must be counted with the usual preparations of varying and uneven thickness. If one counts four fields, for example, and finds an even distribution of the objects in different parts of the specimen, the result can be multiplied by five to find the content of 20

fields. Nothing in this statement, however, should be construed as being contradictory to the well known principle of counting that the more fields counted the greater is the accuracy. It may incidentally be pointed out that this technique renders superfluous the hemacytometer counts of white and red cells which some laboratories now make when these are found in the course of routine examinations. This system of microscopy enables one to report just as easily in terms of volume as of surface area or so many per field or per slide. Reporting in terms of volume content or so many per cc. or 15 cc. offers besides other important advantages such as accuracy the ability to report all objects in the same terms and not as we now report some as so many per surface area, i. e., field or slide, and others as so many per volume, i. e., half ounce of urine.

In reporting by volume, it would be logical and convenient to standardize on the unit represented by the content of one cubic millimeter of urine. Besides bringing urine findings into line with hemacytometer counts such a unit has the advantage of expression in numbers of similar order to those to which we are now accustomed when reporting objects as so many per field or slide, etc. Thus, by concentrating the urine 30 times and sampling the constant 0.5 cc. volume of sediment obtained with the above outlined procedure a specimen of urine examined with 4 mm. objective and 10 power eyepiece and showing one cast per field would contain

in 1 cmm. of uncentrifuged urine	3 casts
in 1 c. c. of	" " 3000 casts
in 15 c. c. of	" " 45,000 casts

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In conclusion, it remains to be said that the lens data were taken from the microscope catalogue of the Bausch and Lomb Optical Company and refer to achromatic systems with Huygenian eyepieces; also that this paper would be incomplete without acknowledgment and expression of appreciation of the careful work and valuable assistance rendered throughout the course of the work by Miss Gertrude B. Casey. For their helpful co-operation and suggestions I am also indebted to and happy to thank Doctors A. R. Rose and P. V. Wells, Chemist and Physicist Prudential Laboratory.

- 1 Addis, Thomas, California State Journal of Medicine, March, 1922, "Determination of the Extent and Nature of the Renal Lesion in Bright's Disease."
- 2 Ockerblad, Nelse F., Journal of Urology, Vol. XIX, No. 4, April, 1928, "An Accurate Method of Estimating Pus and Blood Cells in Urine."
- 3 Heitzmann, Louis, "Urinary Analysis and Diagnosis," Fifth edition, 1928.

Dr. Daley—Dr. Patton will you open the discussion?

Dr. Patton—Since the report of the Committee on Urinary Impairments was approved at the 38th Annual Meeting of the Association in October, 1927 (and these comments are therefore personal and not from the committee as a whole), there has been no apparent need to call the committee together. The suggestions for microscopic urinalysis were believed by most of us to be the first organized steps in the development of uniform methods for insurance laboratories and the committee by no means felt that a finished plan had been prepared and approved.

Dr. Exton has been familiar with many of the questions that have arisen in connection with the work of the committee and when he spoke of preparing this paper, I thought some additional information might be brought before the association. I attempted to advise the committee as early as possible of the parts of the paper that more directly touched their report and they agreed that the association in general should consider the matters and if it was then thought best the association could instruct a committee as to its future duties.

The answers to Dr. Exton's questionnaires showed a lack of uniformity in the microscopic methods that would make the reports differ widely and thus emphasized the necessity of further consideration.

The achromatic systems of standard American makes of microscopes are used in 95% of our laboratories but there is a diversity of combinations of eyepieces and objectives.

The phrase "so that the total magnification is known," used in Rule 4 by the committee, was to reinforce the need of uniformity and with full knowledge that the magnification could be determined with any other combination that might be used.

Rule 4 was suggested because most of the laboratories specified this combination for preliminary examinations; while Rule 6 was suggested because the standard field for counting cellular elements had been the 1/6 or 4 mm. objective and the 6 power eyepiece magnification had been considered sufficient. The use of a single eyepiece is desirable and the 10x is preferable for many reasons.

The 16 mm. objective magnifies 64 times with the 6x (6.4 Bausch & Lomb) eyepiece and 100 times with the 10x, while the 4 mm. objective magnifies 288 times with

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the 6x (6.4 B. & L.) and 450 times with the 10x per the Bausch & Lomb catalogue.

There are many differences in the practices of the various laboratories and unless they translate their actual findings into the committee's suggestions there is no uniformity in the reports. This is clearly shown by the questionnaire answers. Further consideration by the association is necessary and the medical directors in their various offices will have to require the use of the approved methods or the transfer of their findings into the results obtained by these methods.

The closer working distance for the 4 mm. objective, together with the focusing necessary to check the contents of the different layers of the sediment on the slide makes for the use of the 16 mm. objective for identification. The area of the field per Bausch & Lomb catalogue of the 16 mm. objective and the 10x eyepiece is about 18 times that of the 4 mm. objective and 10x eyepiece.

Eyepiece	Objective	Magnifies	Field	
			Diameter	Area
10x	16 mm. (10)	100	1.59 mm.	1.9917 sq. mm.
10x	8 mm. (21)	210	0.78 "	0.479 " "
10x	4 mm. (45)	450	0.37 "	0.1078 " "
6x (6.4)	16 mm. (10)	64	1.93 "	2.9348 " "
6x (6.4)	8 mm. (21)	134	0.93 "	0.6814 " "
6x (6.4)	4 mm. (45)	288	0.44 "	0.1520 " "

(Figures in parentheses are per Bausch & Lomb catalogue.)

Rule 4 might be modified to require for purposes of identification the 16 mm. objective and 10x eyepiece with a magnification of 100 times. This field has a diameter of 1.59 mm. and an area of 1.9917 sq. mm.

Rule 6 might be modified to require the 10x eyepiece and the 16 mm. or 4 mm. objective as deemed necessary in the interested laboratory, but the findings should

be reported as for the 16 mm. area.

Other suggestions can be made but these will serve to illustrate the necessity of some change for the sake of approaching nearer to the uniformity than can be obtained.

Some will prefer to use the 8 mm. objective instead of the 16 mm. or the 4 mm., thus getting the intermediate magnifications with corresponding relative areas.

No matter how much urine may be used, nor what methods of sampling the urine, nor how the sediment is obtained and placed on the slide, it seems that probably none of us have been reporting correctly the number of casts or cellular elements per 1/2 ounce of urine.

Uniform reports must be based upon tests or methods that with different samples from the same specimen of urine will reproduce the same results. This can be done in chemical urinalysis but not with our present microscopical methods.

Should this association retain the 1/2 ounce amount as a basis of reports or should we recommend to the M. I. B. Committee that this is impractical and that a new standard of comparison should be established and make our plans to have this thoroughly studied?

There will be legitimate and reasonable objections on the part of some offices to any such change, but is the question not well worth our careful study? No matter how many previous records any of us may have obtained, if our methods are shown to have been inaccurate or to be at variance with more definite methods, may we not with advantage to all strive to attain this greater definiteness?

Our physicist, Dr. P. V. Wells, has stated that the standardization of microscopic technique involves (1) the sampling of the urine and (2) the microscopic ex-

amination. He thinks the chief source of error in our present technique is in sampling the sediment and that variations of 100 fold can occur in pipetting. If the pipetting errors are eliminated, then the variations in the depth of the layer examined under the cover slip would probably range from 1/2 to 1/20 mm. or 10 fold causing further possible errors. The variable character of the urinary sediments complicates the problem. A field cannot be standardized without specifying the depth of the cell. The hemocytometer depth of 1/10 mm. seems best but to focus high powers through such a depth requires four complete revolutions of the fine adjustment.

The 400 squares in a Thoma-Zeiss hemocytometer, 1/10 mm. deep, contain 1/10 cu. mm. or 1/10000 c. c. If 15 c. c. of urine are centrifuged to 1 c. c. which contains all the casts and 1 cast should be found per the 400 squares, this would represent 10,000 casts in the 15 c. c. of urine. Should the entire sediment be only 1/10 c. c., then one cast per the 400 squares would represent 1,000 casts per the 15 c. c., while one cast in 10 of such fields would represent 100 casts per 15 c. c. of urine.

Dr. Clark—I don't think that I have to say very much about my own opinion or of reporting in terms of volume because I mentioned that last year in the discussion of Dr. Kingsbury's paper. I think that the methods that we use at present are most unscientific and most unsatisfactory for the underwriters or departments. They are most unscientific for our M. I. B. reports. They are most unscientific if ever in the future a medico actuarial investigation is going to be made of the study of microscopical elements in relation to mortality.

I haven't tried Dr. Exton's method. I didn't know

I would be expected to talk this afternoon. In general, I would endorse it absolutely. He has gotten away as we have gotten away from the idea of talking in terms of so many pus cells or so many blood cells or so many casts in a certain number of high power fields. I think one error which will undoubtedly creep into the picture as the various Companies use his method is the fact that as it now stands it is necessary to centrifuge. Dr. Exton has mentioned the inaccuracy of the results arrived at by centrifuging the specimen in view of the variation of revolutions of our centrifuges.

While I haven't done very much myself, I have done something in regard to counting blood cells and casts. I have done, as many of you know, considerable work in enumerating the number of pus cells per cubic centimeter. I think that it is something like three or four years ago that I started that study, and over two years ago we in our laboratory had reports based on the number of pus cells per number of cubic centimeters. From the underwriting standpoint it has been valuable. I know that up at Hartford when I gave a discussion on this particular subject, one of the men said that he was surprised to know that any pus cells in the urine should be considered normal. Yet every textbook that I read says a few pus cells may be found in any normal specimen.

I think right there is one of the chief values of enumerating our pus cells and the same thing will be perhaps to some extent true with the enumerating of blood, and that is this, that some pus cells will be found in any normal urine but actually a study of several thousand cases brought me to the conclusion that in normal individuals there would not be more than 5,000 pus cells in any normal urine, that is, 5,000 per cubic

centimeter of urine in any normal individual. Therefore, when you get a report from a laboratory that there are 20,000 pus cells, I think the case deserves further study and other urines, perhaps two urines, and even writing to the examiner to ascertain if there have been any symptoms of genito-urinary pathology. We have found, on the other hand, that if there are over 50,000, we might as well postpone or decline it because subsequent specimens will show up adversely. That is of value to the underwriting department.

I believe that as we are now reporting to the M. I. B., 50 per cent of us would report pus in one specimen and the other 50 per cent would report negatively if they received the same specimen. So I think in all fairness to our applicants, we should move ourselves to study this matter. Let us all take Dr. Exton's method as now devised, experiment with it. If you don't like it just as it is, let us come to some conclusion so that we may use accurate methods in justice to our applicants.

What Dr. Patton has said leads me to believe that the M. I. B. Committee has a very important duty in studying this thing further. I believe that as our methods of reporting now stand, they are most inaccurate. (Applause.)

Dr. Daley—I am glad Dr. Hunter wasn't here. He would think that the information that he is supposed to juggle actuarially wasn't very exact. Is there anybody here who would like to speak on this subject?

Dr. Exton—As to the matter of sedimentation which Dr. Clarke brought up, I can say that there is no reason at all why all of us should not be in line with one another. Centrifugation should certainly be efficient enough to bring the objects you want to find or count

down into the sediment and one certainly does not want to centrifuge beyond this point because it is superfluous and only injures the sediment. For three dollars one can buy a tachometer and know exactly how his centrifuge runs, but even without this we can all centrifuge efficiently by keeping our centrifuges well lubricated and employing the correct time factor with the manufacturers' speed rating.

As to Dr. Wolf's technique I want to say that in going over the questionnaires it appealed to me as the most interesting of them all because it was the only technic that made any pretense of trying to conform with the requirement of the M. I. B. Committee to report casts per half ounce of urine. We tried the technique out thoroughly and it gave such poor quantitative results that I feared we were not doing it right, and I went with one of my technicians to a laboratory which was doing this technique and saw how they did it. I also visited Dr. Wolf and we repeated our experiments with this technique on eight parts of the same urine, centrifuged at the same time, and not only failed to recover the actual number of objects that we knew were in the specimen but also found that it did not give reproducible results. As I have already said, our own technique, which I thought was pretty good, was also disappointing in these respects. Out of our troublesome work on the many technical details involved, I think it is clear that there are three requirements in the technique of urinary microscopy which have to be fulfilled in order to get anything like quantitative results: first, efficient centrifuging; second, a constant sediment volume or urine concentration factor; third, a technique that will give as even as possible a distribution of objects on the microscope slide.

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Dr. Daley—Thank you, Dr. Exton. It seems to me the proper percentage of blood in the urine and pus in the urine cannot be obtained by microscopy. The chemists might turn themselves toward a chemical test for pus and a hemoglobin test for blood. I don't know whether it is possible or not. I think we will leave this matter of Dr. Exton's paper to the care of our Committee to report on according to their judgment.

If there is nothing before the meeting, the meeting stands adjourned.

SECOND DAY.

(Morning Session.)

President Daley in the chair.

Dr. Daley—The President appoints on the committee to study and report on the advisability of educating and listing examiners and report to the Executive Council, Dr. L. C. Sykes, Dr. William Muhlberg and Dr. H. W. Dingman.

Dr. Wilson, would you like to make some preliminary remarks in connection with your paper?

Dr. Wilson—Mr. President and Fellow Members: I am going to ask you to change the title of my paper to read "The Abnormal Pulse, its Detection, its Recognition and Evaluation." It is, you might say, a re-discussion of last year. The reason I presented the paper is because of my experiences as a teacher. I found out that it is extremely hard to make students understand the value of pulse irregularities in prognosis. It is very hard to teach them to recognize pulse irregularities. The same thing I found true as

a consultant in working with the physicians. They pay a great deal of attention to the murmur irrespective of the size of the heart or other evidences of decompensation. They pay practically no attention to the irregularities which I believe in a measure are a better way of estimating the prognosis and to note any changes.

## THE ABNORMAL PULSE, ITS DETECTION, RECOGNITION AND EVALUATION

GORDON WILSON, M. D.

*Medical Director, Maryland Life Insurance Company*

In any consideration of circulatory impairments it is wise to classify the diseases causing such impairments, and consider their etiology, pathology, and abnormal physiology. From the standpoint of life insurance, we can separate out those causing an appreciable mortality by what we know of their etiology; namely, the Rheumatic group, the hypertension group, the toxic, the bacterial, the luetic, and finally the arteriosclerotic, and the more we study these groups, the more we realize that it is the changes in the myocardium brought about in each group that gives rise to the high mortality. It is a matter of interest and pride to the Anglo-Saxon that the growth of our present day knowledge of diseases of the heart can be said to be almost entirely due to the studies of the English School of Clinicians, and the English School of Physiologists. It was The Collective Investigation Committee of the British Medical Association that definitely proved clinically the inter-relationship of tonsillitis, rheumatic fever, and endocarditis that has resulted in our present practice of removing the tonsils in all cases where either of the two latter diseases are found, and Lambert, of New York, has shown that this "massacre of the tonsils" has resulted in one section of New York City in reduc-

ing the hospital admission rate for valvular heart disease. It was due to the English School of Physiologists that the myogenic theory of heart muscle physiology prevailed over the neurogenic theory, and later it was through the bedside work of Sir James Mackenzie and his pupils that this myogenic theory was put to practical clinical use with the resulting clear idea that we have today of cardiac irregularities. It was due to the statistical studies of Stephen Mackenzie that we first clearly realized that in over 75% of all cases of Rheumatic Fever in children were followed by the signs of valvular heart disease, and that in almost 60% of adults having had one attack of Rheumatic Fever valvular heart disease could be demonstrated. At the time that these studies were made, it was the medical belief of that generation that Endocarditis was the complication of Rheumatic Fever, but today we teach our students that the complication of Rheumatic Fever, and its twin sister, Chorea, is *carditis* and that the myocardium is always affected with the endocardium, and, probably, frequently when there is no evidence of endocarditis during the attack of Inflammatory Rheumatism. The specific character of the "Aschoff Bodies," and their healing with muscle fibre destruction and fibrosis explains the very frequent clinical anomaly of a heart showing no valvular defect, but definite symptoms and signs of circulatory insufficiency, and the other anomaly of a well marked valvular defect with little or nothing in the way of symptoms, and it was these two anomalies that stimulated Sir James Mackenzie to make the studies that have given us our present day knowledge of circulatory diseases, and it is the wise course for the life insurance medical director, and the clinician, to consider

every case of Rheumatic Fever as having a certain amount of carditis complicating it. Our own Medico-Actuarial investigation showed the high mortality in the group giving a history of Rheumatic Fever, and the high incidence of heart disease as a cause of death in this group.

In the other groups of circulatory diseases mentioned at the beginning of this paper, the importance of the myocardial involvement is so well understood and accepted that there is no need of discussing it.

If we accept the fact that the character and degree of the myocardial involvement determines the prognosis, how can we recognize it and evaluate it? Here, again, Sir James Mackenzie has "blazed the trail," and as you all know, it was a result of his studies of heart disease that made him realize that symptoms, both past and present were of the utmost importance, and almost always preceded organic changes that give rise to physical signs. Circulatory diseases to the clinician bear a striking resemblance to Tuberculosis and to Syphilis in their early stages in that in all three the physical signs are slight, if present at all, after the initial invasion, and the diagnosis must rest on certain symptoms in the past. We all accept today the history of a hemorrhage from the mouth in an apparently well person as meaning Tuberculosis, even though there be no physical signs of Pulmonary disease, and "rate up" the premium. Likewise, we "rate up" the premium of one giving a history of a venereal sore, and we should likewise, always "rate up" the premium of one giving a history of Inflammatory Rheumatism. Do we always get correct answers to our medical questionnaire from honest applicants for insurance, and, of course, the vast majority of

applicants are honest? No, we do not, and the reason is the way the question is asked on the blanks of different companies. These application forms can be divided into three groups, in one group no diseases are mentioned, but the examiner is instructed to ask the applicant what diseases he has had, and to note certain specified details in regard to these diseases, and in addition perhaps ask definitely concerning definite diseases, generally stressing the spitting of blood, which is, of course, important, but minimizing Inflammatory Rheumatism and "growing pains," the lay terms for Rheumatic Fever by asking if the applicant has ever had "Rheumatism," which is again a lay term, or rather, a term meaning to laymen an indefinite pain, and separate and distinct from what he considers "Inflammatory Rheumatism." Until the time comes when we definitely ask *as a separate question* whether the applicant has ever had Inflammatory Rheumatism or "growing pains," we will fail to get that all important "sign post" of heart disease. The second type of insurance medical questionnaire for the applicant is what I call the "shot gun" type, and here one finds jumbled together in one question a variety of names of diseases, some important, some unimportant, some rare, and some common, and generally so many that the examiner reads them off so rapidly that the applicant probably hears correctly only the names of a few, and no matter how honest, not infrequently fails to state to the examiner that he has had a disease read to him but not heard by him. The third type of blank is one requiring the answer "yes" or "no" to each separate disease or symptom enumerated, and to my mind this type of blank is the best, provided that the diseases mentioned

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will have a bearing on the granting of insurance, or the modifying of a premium rate. I have dwelt on this point because I believe that if, in the future, we as an association can obtain from all our applicants a definite statement as to whether or not they have ever had Inflammatory Rheumatism or "growing pains," we will obtain data that will be invaluable in future Medico-Actuarial investigations, and will prepare us medical directors to be nearer to what Dr. Dwight has called an ideal medical director, namely, not one whose company has a low mortality, but one that has a controlled mortality.

The next step in recognizing circulatory impairment, granting the myocardial theory of disease, is the study of the pulse, and as I stated in my discussion last year, there is no more valuable instrument for a study of the pulse than the sphygmomanometer, if it is used to study the blood-pressure of individual beats, and not simply used to find the so-called blood-pressure of a person. As I pointed out last year, if one carefully "takes" the blood-pressure of eight or more successive beats, one can at once "pick up" (1) Pulsus Alternans, where every other beat has the same pressure, and successive beats have a different pressure; (2) Pulsus Paradoxus, where the blood-pressure of the beats at the end of expiration are higher than those at the end of inspiration; (3) Auricular Fibrillation, where the blood-pressure of successive beats shows three or more different pressures; and (4) the ordinary type of ventricular extra systoles, where successive beats have the same blood-pressure, but an occasional beat will have a higher blood-pressure. As I then stated: "In order to recognize the above types of pulse with the sphygmomanometer, it is absolutely

necessary that there shall be no air leakage, as one must hold the pressure exactly at the point at which the sound is first heard with the stethoscope below the arm band, and thus listening for the successive beats that one can see registering by the movement of the needle of the Tycos, and noting whether they are heard, and if not heard the pressure can be very slowly lowered, and thus the pressure of individual beats be determined, and the type of irregularity recognized."

Clinical experience has taught us that the first type of irregularity noted above is, perhaps, the most serious, as indicating either a badly damaged myocardium, or at least a "very tired" one. This irregularity except when in extreme degree is almost impossible to recognize by the palpating finger of even the most skillful clinician, but can be readily recognized, as Roger Morris has pointed out, by the sphygmomanometer, and not at all by the electrocardiograph.

Extreme cases of *Pulsus Paradoxus* that can be recognized by the palpating finger, are, of course, significant of advanced disease, but there is no question that a *Pulsus Paradoxus* noted by the sphygmomanometer with ordinary respirations indicates such an increased intrathoracic pressure, such as is found in emphysema commonly, that one can give a none too good prognosis for longevity, though the death that ensues may not be from the heart, but from an intercurrent *Pneumonia*. I have found such a *Pulsus Paradoxus* in very stout middle aged, or old people, and, when I have found such a pulse in such an individual, I have always advised against surgery with an *anaesthetic* unless there was no other "way out." It is of interest that with such individuals, if you

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are able to appreciably reduce their weight, this Pulsus Paradoxus disappears.

The bad prognosis of auricular fibrillation with its liability to sudden death is too well known to need any comment. Of course, cases of auricular fibrillation that are on digitalis therapy are frequently seen which cannot be differentiated from cases of ventricular extra systole, but even in these cases the frequency of the apparent extra systoles, and the age of the applicant would put one "on guard." Extra systoles occurring not more frequently than one in eight in a young individual can be ignored, but even in a young individual when they occur as frequently as one in four, even though tending to disappear with exercise, to my mind show muscle fibers that are at least potentially diseased, and when they occur that frequently, in an applicant over forty, it is no longer potential, but actual disease.

No study of the pulse is complete that does not take into consideration the rate, especially if fast and persistently so, and here again our Medico-Actuarial statistics show a higher death rate with more than the expected from heart disease as well as from Tuberculosis.

The papers presented to this Association in the past on cardiac murmurs, and their differential diagnosis together with studies showing the value of measuring the heart size by different methods have been so complete and excellent that I will not touch upon these indices of circulatory impairment, but in closing I will urge again, as I did last year, that the study of the pulse with a sphygmomanometer is a simple method available to every examiner, and can accurately give us medical directors the data by which

we can evaluate the risk, especially when taken in conjunction with the other information obtained.

Dr. Daley—I presume that the subject which comes up this morning is of more acute interest to us than nearly any other subject which appears in this program or any of the preceding programs. I mean a subject of clinical interest. We all have had sad experiences with the middle aged man who passes what appears to be a first-class examination and in a few months passes on and out. We use the fluoroscope, we use the electrocardiogram as much as we should, but despite these tests, we sometimes choose a risk which turns out to be an unfavorable one.

This Association is highly honored today by the kindness of Dr. Lambert coming here to tell us something about heart disease, for there is no man in this country that knows more about heart disease than Dr. Lambert. Most men here know that Dr. Lambert's father was the distinguished Edward Lambert, Medical Director of the Equitable Life, and a prominent member of this Association. Dr. Lambert. (Applause.)

Dr. Lambert—Thank you, gentlemen. It's always a great pleasure to come here and meet men who I know were friends of my father, and few men have been as lucky as I was to have had such a father, who was a companion from my boyhood up and the best companion I had throughout my life.

## MYOCARDIAL DEGENERATION AND CORONARY THROMBOSIS

ALEXANDER LAMBERT, M. D.

Mr. Chairman and Gentlemen: It is with peculiar pleasure that I accepted the invitation of your Chairman to read a paper to you, on the prognostic outlook of the non-valvular diseases of the heart in senescence. Among the earliest recollections of my boyhood, is that of listening to many discussions of the prognosis of insurance risks, for, as some of you will remember, I was brought up in that atmosphere.

You well know how to gauge the valvular damage from the diseases of the heart in early life, and you can accurately gauge the chances in vigorous middle age of the longer or shorter duration of a heart that has a recognizable valvular scar. But an accurate estimate of damage in hearts showing only myocardial or coronary lesions remains still an unsolved problem.

Of late years, however, the profession has begun to recognize more accurately the non-valvular cardiac diseases which give no physical sign to the stethoscope, but which are exceedingly important as causes of death, between the ages of 50 and 60, or 60 and 70, as senescence occurs, before old age really is established. These senescent years are the times in many men's lives of the greatest value of mental strength and judgment, and are their years of greatest success, but they are the same years in which most often occur these sudden, unexpected deaths

that have been in the past laid to many non-cardiac lesions, from acute indigestion to apoplexy, but in reality, are due to disease of the coronary arteries.

Many a man, apparently only tired, has been sent out to obtain rest and recreation in vigorous exercise as golf, or similar exertion, and hurried to his end thereby, because the real lesion in his heart was unrecognized, neither stethoscope nor blood pressure having given any indication of the condition.

There are practically two conditions of the non-valvular diseases of the heart which clinically can be definitely separated, and which run separate clinical courses. First is that, in which the myocardium itself is chiefly involved, and in which the break down occurs through the degeneration and break down of the myocardium, the coronaries remaining competent. The other is the disease of the coronary vessels, in which the myocardium does not degenerate, except as it lacks the blood supply from the degenerating arteries. In the first instance we must accept the condition of a man's myocardium at any given age of life, as representing the algebraic sum of the injuries it has suffered, and the recovery it has made from the many infections that have injured it. We must recognize that all through life any general disease of the body, or any of the mild intercurrent diseases, usually neglected, and often held in contempt, such as attacks of bronchitis, severe colds, attacks of tonsillitis, produce varying intensities of acute degeneration of the myocardium, which usually lasts but a short time, but which are not a negligible quantity. Most frequently the recovery is as rapid as the duration of the infection, but there comes a time after 50 or 60 years of age, when a severe attack of grippe, an

acute cold, gall bladder disease, or some other infection, will cause a degeneration from which the heart does not fully recover, it has lost the resiliency of youth, and its power of complete recovery.

The chronic pyorrhea, and the apical abscesses of the teeth, and purulent tonsils seem more often to cause a chronic, or sub-acute infection, rather than an acute degeneration, which does serious damage to the myocardium, and goes unrecognized. When these sources of infection are cleared up the heart recovers slowly, but usually not fully, and then added to this chronic degeneration, there is added some acute intercurrent infection of a cold or bronchitis, and a serious damage is done the heart, which is made evident by the definite symptoms of a cardiac break down with its dyspnoea, oedema, etc.

After 60 years of age fully 15% of men that suffer from influenza, receive serious injury to their myocardiums, from which, in my experience, they usually recover the first time, and apparently regain a good condition of health. When they have so recovered, the question of serious permanent damage done to the heart is best estimated by the enlargement produced during the process of recovery. The enlargement is not, however, a sign of strength, but is the evidence of a beginning loss of vigor in the heart muscle.

The electrocardiogram will frequently begin to show the left sided preponderance, and the heart may go on for a number of years, but as the intercurrent infections occur, the myocardium receives in some instances an increased acute injury, from which it may or may not fully recover, and the cycle goes on; but with a heart that is gradually diminishing in the power of its contracting strength, until finally

between the periods of infection it begins to show increased dyspnea on exertion, increased inability to swing the cycle of its circulation, with beginning slight edema of the ankles at night, and there begins to be evident the characteristic break down of myocardial degeneration, to which the heart finally succumbs.

This slow breaking down of the cardiac strength often can be held in abeyance through digitalis, and constant care, but in judging of hearts that have no valvular lesion, and which do not show a murmur until the heart is dilated, the secret of their strength or weakness lies in the fact of whether they retain practically their normal size, or whether such hearts begin to show a slight enlargement. This slight distinctly demonstrable enlargement of a senescent heart is the beginning of injury, and its prognostic outlook rests in inverse proportion to its enlargement. You notice I am not designating the condition a hypertrophy, as the enlargement is usually a mixed condition of hyperthrophic increase of muscle, and a certain amount of increase in the size of the cardiac chamber from the inability of the cardiac muscle to perform its full contractile function.

These hearts do not carry with them the sudden and unexpected deaths that the diseases of the coronary arteries show, unless the coronary artery be also involved in the degeneration, and the two processes run simultaneously. Hypertension does not necessarily come with the myocardial form of non-valvular heart disease. Often a heart will hypertrophy under the increased load of hypertension and an enlarged heart due to hypertension will carry on its work as long as the myocardium is not injured by infection. The hypertension itself may be due to spasm

of the small peripheral arteries, produced by some disease processes from infection, or of unknown origin which leaves a spasm in the peripheral small arterioles giving the permanent hypertension, and the same infection that may injure slightly the myocardium, may also injure the peripheral circulation, the increased tension, and the injury to the myocardium occurring at the same time; often, however, the myocardium suffers from its infection without a variation of the blood pressure to give a hint of the injury left behind. In these senescent hearts therefore we are thrown back on the evidence contained in the heart itself. The average sized, not enlarged heart, possesses a better prognostic value than an enlarged or hypertrophied heart.

In recent years, due to the work particularly of Herrick of Chicago, the profession has been able to differentiate the diseases of the coronary arteries before the final thrombosis occurs, and often before the occurrences of the attacks of cardiac pain, to which the profession had so long been accustomed in the forms of angina pectoris.

It is not the anginal and pain giving type of the disease that I wish to discuss with you today. That is an intensely interesting study, but it is a study in itself, and to do it justice, its discussion would take up more than the time that I should consume this morning.

The question which your Chairman posed to me was, is there any clue, which if followed, would show the liability of a sudden unexpected death, through coronary thrombosis? Are there any symptoms which give warning to the liability of these cases of sudden death in what are considered vigorous men? Let us con-

sider the pathological changes that are taking place in a heart that is showing senescent damage in its coronary circulation. You will remember that the heart is nourished by its two coronary arteries, the right and left, which start from the aorta, and are usually given off in the little cavity or indentation, just back of the aortic valves, and here in the sinuses of valsalva atheroma, or disease of the orifices of these coronary arteries seldom occurs. But if, as is not infrequent the coronary arteries are given off above the level where the valves fold back against the aorta, they are frequently involved in atheroma, or other diseases of the aorta. The exact position therefore in the aortic wall of the orifice of either coronary is not an unvarying location, and the change in position of its orifice carries with it a varying liability to injury and occlusion of its orifice.

These coronary arteries are really *vasae vasorum*; they were originally the *vasae vasorum* of the embryonic tube, from which the heart is formed. The first portion of the arch of the aorta, the ascending portion, is supplied by branches from the coronary arteries, although they are given off from the aorta, and the blood supply of the first portion of the aorta is from the same coronary arteries that supply the heart itself. This is seldom recognized, and almost universally forgotten.

There are branches of the pericardial arteries that occasionally come down in such size that they can form a collateral circulation to the heart, if either of the coronary vessels should become plugged. This pericardial supply is, however, usually of small size.

As senescence takes place the tiny branches and capillaries of the right side of the heart, especially

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As senescence takes place the tiny branches and capillaries of the right side of the heart, especially

of the right ventricle, diminish in number and obliterate. Over the left ventricle, on the contrary, there is not only an increase in the size of the tiny vessels, but actually new tiny capillaries are formed in the fatty tissues of the heart itself. Coronary arteries are not end arteries, they do not terminate, but the branches of both coronary arteries, not only anastomose abundantly with each other, but the branches of each coronary artery abundantly anastomose with the other branches of the same artery. Disease in the coronary arteries may be confined to the large size vessels, it may be confined to the tiny capillaries, or to the medium size vessels. Monckeberg mentions one or two cases in which one or both coronary arteries were absolutely plugged and branches from the pericardial arteries as collateral circulation, were sufficient to keep the coronary arteries beyond their closed orifices perfectly normal with sufficient circulation for the heart and myocardium. These were, of course, extraordinary and unusual cases and not the normal ones, but it shows how little can be judged at times from the aortitis in the aorta as to what the normal circulation in the heart may be and on which really depends its powers of contraction.

As senescence occurs, there is a continuous tendency to the obliteration of the tiny capillaries, and the gradual degeneration of the individual muscular cells supplied by these capillaries, with subsequent replacement by connective tissue, which produces the fibroid replacement of the cardiac muscles.

The causation of the arterio sclerosis of the coronary arteries is not fully known. Infections, such as syphilis are unquestionably a cause, but cardiac syphilis occurs only in about 10% of the total number of those afflicted

with cardiac disease. Probably other diseases cause a degeneration of the coronary circulation, as they do of the myocardium, but the causes of arterio sclerosis are not conclusively and definitely differentiated. Over indulgence in food and alcohol, a sedentary existence which does not burn up excessive intake of food as middle age goes by, is believed to be the chief cause in producing the degeneration, and probably is. Unquestionably a continuance of physical activity, and temperate living pushes away the early occurrence of senescence, but we must frankly admit, we cannot lay down positive statements concerning the causation of arterio sclerosis, and must frankly recognize its occurrence, and leave the explanation to the future.

Diseases of the coronary arteries do not express themselves in high tension of the general circulatory system, and coronary thromboses, while they occur in patients who suffer from hypertension, more frequently occur in patients whose systemic blood pressure is normally low.

In 325 cases of rupture of the heart following thrombosis Hagen and Nuzum found that in less than 25% there was a suggestion of heart disease previous to the cardiac rupture. In 483 cases of spontaneous rupture of the heart, due to coronary thrombosis, the left ventricle ruptured in 83% of the cases, the right in 10%, the right auricle in 5%, and the left auricle in only 1%, and the intra ventricular septum, or both ventricles, ruptured simultaneously in .008%.

Coronary thrombosis of the left ventricle occurs in 2/3rds of the cases in the long descending branch, producing an infarct in the apex, close to the septum. The transverse branch of the left coronary supplying the posterior wall of the left ventricle is involved in

1/3rd of the cases. These figures, of course, do not include the numerous occurrences of thromboses of the smaller vessels, which do not cause death, and which can be readily recognized by the sudden fall of blood pressure, with dizziness, and irregularity of the heart's action, accompanied with a leucocytosis, and often a pericardial rub. When a patient lives long enough after the occurrence of a coronary thrombosis the condition is usually easily recognizable. When one is called, one sees a patient, livid white, sweating severely, having suffered an acute attack of pain, or still suffering intense pain, or curiously with no pain at all; the blood pressure well below 100, with, if it is sought, a leucocytosis running as high as 16,000, or 20,000, and on the day following the attack, frequently a pericardial rub. The heart sounds in the acute attack are very distant and feeble, and frequently the pulse is irregular, besides small, and often increased in frequency. The pain is characteristically in the epigastrium, and because of this situation is not usually recognized as of cardiac origin. When this pain is very intense, it is usually styled abdominal angina. With such location of intense pain, with the collapsed condition of the patient, the question frequently arises of an acute surgical condition of the abdomen. There may be even at times a sufficient abdominal rigidity, to raise the question of some acute perforation in the upper abdomen.

There is one differential symptom, however, which is of the greatest value under these circumstances, and that is when the lungs show a beginning slight edema with many generalized sub crepitant rales. The thrombosis of the left ventricle produces this beginning pulmonary edema, which is only heard with

the stethoscope, and is not sufficient to cause rattling rales in the throat. This differential point, beginning edema in the lungs, is very important as pointing distinctly to the failure of the left ventricle, and away from perforation in the abdomen. If, as sometimes occurs, the pain radiates down into the arm, instead of being in the epigastrium, the cardiac situation of the lesion is usually recognized, but the epigastric pain occurs more than 2 and a half times as frequently as the pain in the arms. These patients may die almost instantaneously, or they may live a few hours, or 48 hours, or the thrombus may soften after a week and then rupture, or they may live a month, and the thrombus soften, and rupture of the heart occur then.

Are there no symptoms then before these sudden attacks of coronary thrombosis? There are, and very clearly defined ones, but they have not been usually accredited to this condition. Patients suffering from asthma, so called, especially after eating, followed by attacks of gas and distress, patients who cannot walk after eating because of a suffocating feeling, which is relieved as gas is belched up, are those who are suffering from a beginning degeneration of their coronaries. Not infrequently these same patients have large amounts of gas in the colon, which must be passed by the bowel. These patients may have at night sudden attacks of dyspnea, with, or without the belching and vomiting, but the attacks of dyspnea come without apparent cause, or may follow some slight exertion. These attacks of dyspnea are usually laid to asthma of some kind, and are not considered cardiac. The hospital patients coming in with a coronary thrombosis, in the great majority of cases, complain of epigastric

pain, and their inability to raise gas from their stomach. You cannot distract their attention from these two symptoms. Often patients find that they have increasing dyspnea on exertion, and out of proportion to the exertion, and the dyspnea is often accompanied with precordial pain, or often pain in the arm, but most frequently around the waist into the epigastrium. You may ask me where that pain comes from. Brauecker recently in studying the sympathetic system in the chest has found that contrary to the idea of the old anatomies, there is a regular nerve that comes off from the sixth dorsal vertebra and runs into the aortic plexus. It is probably through that nerve that this pain comes, because the nerves of pain in the heart and aorta, which are the same, come in the greatest amount from the first and second dorsal segments. They also arrive from the third, fourth and sometimes the fifth. Brauecker found that they went down as far as the seventh and the old French anatomies, I notice, show aortic branches that run down as far as the ninth—but all that anatomy belongs to angina pectoris. Often these patients tire more easily than they should, and they tire, not so much from physical exertion, as that they find that the nervous strain, and intellectual exertion of their work, produces a disproportionate exhaustion, and these patients are the ones that are considered nervously tired, and have so often in the past, been sent out to over exertion.

Many patients that suffer from sharp pain in the epigastrium with collapse, recover from their attack of coronary thrombosis, and continue their existence with evidence of a marked diminution in their cardiac reserve, and the history of their cardiac decline is then

similar to the slowly, but persistently, degenerating myocardium. Or their decline may be punctuated with attacks of dizziness, faintness, cardiae irregularity, dyspnea, and general weakness, the signs of thromboses in the small vessels of the coronaries.

The end results therefore, of the slowly degenerating myocardium produce the same symptoms whether it be, that the myocardium itself is damaged by recurrent infections, or whether it is suffering from areas of smaller or greater size of scar tissue, produced by the thromboses of the coronary arteries supplying these areas.

Any coronary thrombosis is greatly aided in its recovery by the exceedingly abundant collateral circulation which the anastomoses of the coronary vessels give, and this same abundant anastomosing of the blood supply, produces results which are often the cause of astonishment, as one looks at the fibroid scar in many of these hearts. One also not infrequently sees death resulting from some fresh thrombosis, in a heart that shows one or more previous scars of earlier thromboses.

The electrocardiogram is often of great value in showing these thromboses; the variation from normal consists in the inversion of the T wave in one or more leads, but the most characteristic of all the lesions is the acute coving of the T wave, as it is called, in which the curve arises straight from the end of the R. S. curve without coming down to the normal line, and swings upward, ending in either a large T wave, or an inverted T wave, the T wave being usually in the reverse direction of the R. S. complex. This is usually present in the acute stages, but frequently disappears as recovery takes place. I brought there in

that paper passing around the room several histories from my records in Bellevue Hospital from the Fourth Division.\* There are six cases there, one of them giving us the electrocardiographic curves of the thrombotic condition in the coronaries but in that case there was no autopsy. There are four other cases with autopsies which showed the characteristic curve. Then there is No. 6 which shows the record of a patient who had repeated attacks of pain and dyspnoea and came in showing an increasing cardiac degeneration like an old myocardial degeneration but with repeated attacks of thrombosis, evidently injuring vessels of small size. He had a continuous inverted complex of his electrocardiogram and is rather interesting in the pictures given. The youngest patients in whom I have seen this condition were one little child of six and one of ten that were brought in collapsed and which showed such characteristic heart curves that there must have been a coronary thrombosis. We unfortunately were not allowed to make a post mortem on these two patients and they lived less than twenty-four hours after they came in. They had had rheumatic diseases of the heart and evidently the disease proceeded to cause thrombosis in the arteries as children of that age almost universally have carditis, every tissue of the heart being involved.

These changes described are characteristic of the coronary thromboses, but a coronary thrombosis of serious import may be present, and the electrocardiogram may remain normal. I have brought with me here a short digest of half a dozen histories of coronary thrombosis, as they have presented themselves in the

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\* Editor's Note—These have been omitted as we were unable to obtain good reproductions.

service of the fourth Division in Bellevue Hospital. Some of these, as you will see, show the characteristic picture in the electrocardiogram and the clinical history, but we have no autopsy to confirm it. Four of them show the electrocardiograms and the symptoms proven by autopsy. There is a normal electrocardiogram to refresh the memory of those of you who do not work with this instrument. One, #6 shows the history of a patient with recurrent attacks of thrombosis with the electrocardiograms on readmissions. This patient went out, as he recovered sufficiently to leave, and was discharged with a diagnosis of chronic myocarditis each time; that was because coronary thrombosis is not yet accepted in medical nomenclature in the admission and discharge of hospital patients. This, I am glad to say, will be changed in a few months.

In our prognostic conclusions therefore, we come to the following results; patients with a history of recurrent infections, showing during these attacks, evidences of an increased dyspnea or exertion, or edema, or both, are patients in whom the myocardium has been injured, and in gauging them as insurance risks, valuable information may be obtained by close observation of enlargement, or lack of enlargement of their hearts. The prognosis varies inversely, as I have already said, as the enlargement of their heart. The heart of a senescent man has a favorable prognosis in direct ratio to its normal size.

Individuals after fifty, that have histories of gaseous dyspepsia of discomfort after eating, of fatigue disproportionate to their exercise, physical or intellectual, should be looked askance upon in gauging the value of their cardiac circulation.

In the non-valvular diseases of the heart, a negative stethoscopic finding is a great deal like a negative Wasserman reaction, it is not a certificate of either health or virtue.

The following cases illustrate some of these points.

#### CORONARY THROMBOSIS

##### 1

Male—age 37—admitted: 2-3-28—died: 2-16-28

*History:* Onset 1-2-28, patient was suddenly seized with a severe precordial pain, radiating to both shoulders and down both arms to the elbow joints.

##### *Characteristic Findings on Admission:*

W. B. C. 16,000

Polys. 57%

Lymphs. 33%

Transitional 4%

Temperature: 100.5

Blood pressure: 76/56

Pericardial friction rub over the apex.

##### *No Autopsy:*

The E. K. G. shows—Coronary T in all three (3) leads.

##### 2

Male—age 56—admitted: 6-11-28—died: 6-29-28

*History:* Onset 3 days before admission, patient developed acute pain in pit of stomach and immediate dyspnea. Several hours later the pain settled in the precordial area. Pain was continuous, relieved only by morphine.

*Characteristic Findings on Admission:*

W. B. C. 11,000

Polys. 70%

Lymphs. 22%

Temperature: 102

Blood pressure—1st. day—126/90. During the next 2 weeks as follows: 90/86; 88/84; 92/86.

Pericardial rub—questionable.

*Autopsy:* Heart—Coronary ulcerative atherosclerosis with occlusion myocardial degeneration and sclerosis.

Acute Pericarditis.

The descending branch of the left coronary is occluded with complete infarction of the apex of the left ventricle.

The E. K. G. shows—Low voltage—Coronary T in Leads 1 and 2.

3

Male—age 49—admitted: 2-3-28—died: 2-4-28

*History:* Dyspnea and pain in the chest—2 weeks duration. (Patient speaks very little English.)

The physical findings were of an enlarged heart, sounds of very poor quality and the clinical evidence of acute myocardial failure with extreme dyspnea and cyanosis.

Blood pressure: 82/80

*Autopsy:* Heart—Hypertrophy and dilatation.

Coronary Sclerosis.

Coronary Thrombosis.

The occlusion is of the right branch of the anterior

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coronary artery with infarction of the posterior half of the inter-ventricular septal wall.

The E. K. G. shows—Right bundle branch block—partial block.

4

Male—age 38—admitted: 5-27-28—died: 6-8-28

*History:* Onset 3 days before admission, patient had pain in the back just above the pelvis. Three days later it disappeared and reappeared in the pit of his stomach.

Clinical examination decided on the diagnosis of Sub-acute Bacterial Endocarditis with an acute pericarditis. Coronary Thrombosis was also considered, because of the pain, together with the pericardial rub.

*Autopsy:* Heart—Sub-acute vegetative endocarditis of the aortic valve.

Multiple myocardial infarcts (embolic in origin).

Coronary Aneurysm.

Acute fibrinous pericarditis.

The E. K. G. shows—Partial block—T inverted—Leads 2 and 3.

5

Female—Age 54—admitted: 1-14-28—died: 4-3-28

*History:* Sudden onset 2 months before admission with dizzy spells, headache and dyspnea. No previous history of cardiac failure. The physical findings were marked respiratory distress; enlarged heart with gallop rhythm and sounds of poor myocardial quality; extensive edema of both legs. The blood pressure 130/100 average. Systolic varied between 160 and 110. The

diastolic never fell below 90 min. There was never any pain, either precordial or with respiration.

The patient had a Chronic Interstitial Nephritis as a basis for her hypertension with secondary hypertrophy of her heart, but the real cause of her myocardial failure was not diagnosed.

There is no doubt that the sudden onset, coincided with the coronary occlusion and the extensive fibrous replacement of her myocardium, contributed towards her rapid failure and explains the ineffectiveness of digitalis medication.

*Autopsy:* Heart—The descending branch of the left coronary is markedly atherosclerotic and is completely occluded at a point—1" from the coronary orifice, with a large area of myocardial fibrosis in the left ventricle, supported by that artery.

The kidneys showed Chronic Interstitial Nephritis.

The E. K. G. shows Coronary T in Leads 1 and 3. R-2 is negligible.

## 6

Male—S. A.—age 67—admitted: 8-21-28—discharged: 8-26-28

*History:* Onset 2 years ago with burning pain, radiating from epigastrium up to sternum; this lasted for 3 weeks. Three weeks prior to admission the pain recurred, especially after meals. Has difficulty in breathing associated with nausea but no vomiting.

Blood pressure—140/80.

W. B. C. 14,200—N. P. N. 34—Sugar 140.

Patient was discharged A. O. R. improved with diagnosis of Chronic Myocarditis.

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Patient was readmitted—10-15-28 with the same complaints as above.

Blood pressure—80/? 105/80 115/75 105/60.

W. B. C. 31,400—Polys. 84%—Lymphs. 14%.

Patient was discharged 10-29-28 with the diagnosis of chronic Myocarditis—and Adenoma of Prostate.

Patient's 3rd admission was 11-5-28 with the same complaints; but he also complained of precordial pain and orthopnea of 1 day's duration. Patient says he has felt dyspneic and very weak since leaving the hospital 10-29-28.

Blood pressure—130/74.

N. P. N. 49—Creat—2.4—Nacl. 412.

The temperature remained flat throughout the three admissions.

Patient was discharged A. O. R. improved 11-17-28 with the diagnosis of Chronic Myocarditis—and Adenoma of Prostate.

Dr. Daley—Dr. Cook needs no introduction.

Dr. Cook—Mr. President and Gentlemen: I want to first express my very deep sense of appreciation of these two splendid papers by nationally known clinical teachers, Dr. Wilson also being a well known life underwriter.

It seems to me that there is no subject before life underwriters today which is of more importance than this question of cardiac differentiation and diagnosis, especially of the group of cases which is being treated here today, the myocardial degenerations of middle

and later life. Dr. Dublin, of the Metropolitan, has given us some figures that are very easy to remember, and I like to keep them in mind because they illustrate so well the tremendous importance of this subject to us in our daily routine work. Dr. Dublin has shown that one out of every five of the population today is due eventually to die of some form of cardiac disease; also that a child of 10 at the present time has three times the chance of dying of heart disease than he has of tuberculosis. This increases rapidly and at 35 he has four times the chance of dying of heart disease as of tuberculosis.

In a series of cases of the Metropolitan covering 20,000 deaths from heart disease in a single year, 17 per cent of those were under 40 years of age and 83 per cent over 40 years of age. This always makes me realize that in the larger type of cases, particularly the cases that were spoken of so frequently yesterday, of the brokered case on which we have past M. I. B. impairment record who applies for \$100,000, a million or two million—these men are past middle life and these instances of cardiac degeneration are tremendous, and, as we have learned from the papers this morning, the difficulties of differentiating them are extreme.

I have never gone away from a meeting of this organization, it seems to me, in the twenty years that I have been coming here, without receiving from Dr. Rogers a most valuable and pertinent suggestion. Last year the thing that I carried away was a remark of Dr. Rogers to the effect that the broad general classes of our differentiations were laid out at the present time and that what we had to look forward to in the immediate future in improving our underwriting prac-

tices was a subdifferentiation and a division of our classes into small classes so that by finer methods of diagnosis and prognosis we could come to a fairer differentiation of some of these larger classes. It seems to me that that is particularly important in these cases of cardiac disease. When we realize, for example, with hypertension cases, a man with a blood pressure of 160, may die within a week and a man with a blood pressure of 220 may live twenty years in active business life, it certainly makes us realize that any mortality rating based entirely upon systolic pressure needs further work and further study.

I think Dr. Wilson has given us a very practical, rough method of interpreting some of these cardiac irregularities. I agree with Dr. Rogers in thinking that the New England Mutual has given us a very valuable lesson in attempting to differentiate between classes of cardiac disease, although I am not myself convinced that the method is practical or that it does permit us to act upon these cases with very much more definiteness than we could otherwise do with the symptoms and signs that we had previously been receiving. It does, however, tend to keep the subject prominently before us.

Dr. Lambert, in his numerous papers on the subject of cardiac disease, and again this morning, has emphasized one of the two things that I wanted to bring to you this morning and to place emphasis upon. First of all, cardiac hypertrophy. Dr. Lambert, with other clinicians, has over and over again emphasized the importance of a differentiation of the seriousness of cardiac degeneration past middle life and pointed out the necessity of knowing something about the size

of the heart. I had occasion to present last year some evidence from the point of view of the X-ray and the orthodiascope especially, and I do believe that if we are going to differentiate these cases and discover the cases of myocardial degeneration before we assume liability on them, we will have to use the X-ray more and more. It is said, of course, that the X-ray is not practical, but the same thing was said of blood sugar and the urinalysis and the same of blood pressure twenty-five years ago. As a matter of fact, the X-ray is practical. In any city of 5,000 or 10,000 in the United States we can today obtain a reasonably competent X-ray opinion and we will soon be able, as the men become equipped with orthodiascopes, to obtain a graphic tracing of cardiac outline which we can add to our records. So I feel quite confident that we are going to install X-rays in our Home Offices and we will demand X-rays in differentiating some of these border-line cases in men past middle life.

The second point that I want to bring out is a conviction that we are also going to adopt Dr. Lambert's suggestion in regard to the further use of the electrocardiogram. It has been stated by competent men that in the cases of serious myocardial disease or serious cardiac disease—because a considerable number of them are probably not myocardial disease at all, are not actual myocarditis—as high as 90 per cent of cases of serious diseases of the heart in past middle life will give some indication or some hint from a properly interpreted electrocardiogram. As Dr. Lambert has said, it is usually in the nature of an inversion of the T wave in the first or second leads, or a flattening or lower voltage of the T wave, and I believe

that in differentiating these large cases, the cases on which we are assuming liability with a past M. I. B. history, we will have to ask for an electrocardiogram interpretation before we act intelligently upon them.

If any of you have not read in the proceedings the paper that was given last year at the Medical Section of the American Life Convention by Dr. Meyers of Des Moines, I am sure you will be tremendously interested in reading it. At the Medical Section of the American Life Convention, Dr. Meyers outlined from a very practical underwriting point of view the different cases in which we can receive very valuable aid from an electrocardiogram interpretation.\*

Dr. Daley—Our most serious deaths from diabetes are very apt to occur among standard risks. We can say the same thing of the heart.

Dr. Rogers, will you give us the benefit of your opinions?

Dr. Rogers—I have been very much interested in Dr. Wilson's contribution of last year and his further reference to it in his address this year, because I believe that he is offering us another method, a simple method, of testing out the validity of the heart. The method which the New England Mutual offered us four or five years ago and which they have continued to use—I think that many of us have used it more or less—was so far as I know the first definite effort to determine the validity of the heart by a simple method and without machinery of any sort, that is to say, without the use of the X-ray and without the use of the electrocardiogram, which is not accessible in many parts of the country.

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\* Meyers, Proc. Med. Section American Life Convention, 1928, page 206.

Now, the picture that I get in my mind of the work that we all of us have to do in the future is to develop these two methods and any other method that is offered to us later and maintain a statistical study of each one of them so that at the end of a few years we shall be able to determine to what extent cases that show abnormality under these methods are impaired. I know of nothing that we need more urgently. We can't, in our routine work, have the benefit of the opinion of clinicians like Dr. Lambert. We are bound to use very largely the ordinary examiner, and we need to be able to place in his hands a method that will help us to determine what the significance really is of various types of abnormalities of the heart. We get, for example, an intermittent pulse. We know in a very general way, the mortality to be expected from intermittent pulses. We know in a very general way the significance of various degrees of that abnormality. Now, what we really want to know is this: Can we find, can we have available, some very simple method, a method which our examiners can use, which will enable us to differentiate between the serious and the insignificant types of abnormality of the heart. From a business point of view, this problem is one urgently in need of solution. I think that it is the experience of every one of us to pass judgment upon cases which have been repeatedly offered substandard insurance or rejected altogether and which are submitted to us for standard insurance on the ground that other companies have taken them at standard rates. How shall we act upon these cases? We don't know yet whether these pioneers are on the right track or not. Dr. Wilson's method may help us to determine that any given intermittent pulse is of no consequence, that it is within

the limits of the normal. Dr. Frost's method may indicate that an apex murmur is unimportant, that the heart is in good condition, vigorous and will stand up under the strain. We don't yet know. We need statistical evidence.

We need to organize ourselves so as to be able to answer these questions. Yesterday we adopted a resolution asking the Joint Committee on Mortalities to determine the value of various different types of impairments and to publish their recommendations to the life insurance world. I wish that we could have gone further—but I doubt that it is yet within the limit of practical politics—I wish we could have decided to establish a Research Bureau, to be conducted at the expense of all of the life companies, in which might be measured and tested out these various methods that are proposed to us. Within the next five or ten years, with such a Bureau, we should be able to obtain the answers to our problems. But I doubt very much that at this time the life companies would undertake such a scheme. It is safe to say, however, that the younger men here will see the day when life insurance executives will realize the necessity of united effort among the companies in that direction.

I appreciate very much Dr. Lambert's address; I have enjoyed reading Dr. Wilson's paper; I offer my thanks to these gentlemen for the fine work they are doing for us.

Dr. Daley—As I said yesterday in my address, this association is more indebted to Dr. Rogers for the improvement of medical selection and methods of selection than to any one man. It is sometimes a little difficult for us to catch the workings of his mind, but it will pay us all well to keep the thoughts and sug-

gestions that he brings before us in our minds to turn over, because they always bear fruit—and good fruit.

Dr. Old—When any organ is attacked by a disease, we usually have three kinds of signs and symptoms—the objective, which are caused by the structural changes; the functional; and the reflex. As Dr. Cook has just said, when a man comes up for life insurance, we rarely get any history of subjective symptoms, or the reflex ones, unless the examiner is somewhat of a detective and also a diplomat. The consequence is that we have to rely mainly on the objective ones for diagnosis.

This being so, in cases of myocarditis, there is not usually obtainable early evidences of cardiac muscle exhaustion or fatigue, as acid eructations after meals, pain in the chest or arms after exertion, occasional dyspnea, or swelling of the feet and ankles at the end of a day's work.

A somewhat common abnormality reported by the examiner is an intermittent or irregular pulse. This spells to the average examiner premature contraction or extra-systole. If they occur infrequently, with a regular beat intervening, and lessen in number or disappear after exercise and during the twenty seconds immediately following, we are apt to consider them as functional and benign.

Arrhythmia to the heart muscle is of as great importance for diagnosis and prognosis as the heart murmur is to valvular disease. Hypertrophy and arrhythmia are of equal importance as hypertrophy and a heart murmur.

In other words, organic disease of the heart muscle or valves rests largely upon the presence or absence of hypertrophy.

Dr. Lewis, in studying 121 cases of premature contractions, found that 71 per cent of them occurred in diseased hearts, 10 per cent were apparently healthy, and the others occurred in such conditions as lumbago, exophthalmic goitre, gastric disease, and gall bladder disease. Dr. Purdy, in 50 cases of premature contractions, found that 84 per cent of them occurred in cardiac disease and 10 per cent were due to some active disease. That shows that the rough test that we have been employing is certainly not an accurate one.

The functional test of exercise and the one that has been developed, the cardio-respiratory test by Dr. Frost, will tell you the functional capacity of the heart to carry on the circulation, but it does not tell us anything about whether disease is present or not in the muscles, especially if it should be in a very isolated or limited area. We realized that, and we have—the Philadelphia Agency being about the largest agency we have—established at the Home Office an electrocardiograph and also a fluoroscopic screen. We can now obtain a chart of the thorax and also the heart, and thereby measure the size of the heart. With the electrocardiogram and this chart of the heart as valuable aids, we feel that we can come pretty near diagnosing whether there is any diseased condition present or not in the heart muscle.

The only way that can be extended into the field is to have any person over 35, or certainly over 40 years of age, in whom there has been a report of any arrhythmia, go to some clinician and have an electrocardiogram made. That's going to cost money. We are not going to get it for the ordinary five-dollar examination, but when we take into consideration that

the men at that age usually apply for large amounts of insurance, the cost may be very little to have a thorough study made of the heart.

I was very glad that Dr. Lambert mentioned one group of individuals who are prone to myocardial disease—the sedentary individual.

I believe we are more apt to fall down in diagnosing myocarditis, coronary thrombosis, and angina pectoris in that class than in any other.

He has been successful, but does not know how to play. He is always a good worker in his church, and spends his spare time in philanthropic work, or attending Board of Director's meetings, or spending two or three hours at his club every day. He just sits at some desk all the time and is "strictly business." He practically takes no exercise, not even walking, for he rides in his automobile for short distances.

You know one difference between a man and a woman when they are floating on the flood-water of prosperity is in the indulgence of tastes. Those of the woman turn to fine clothes and jewelry. Those of the man mainly turn to the appetite of the stomach, and healthy hunger is often turned into gluttony. We know that more early graves are dug with the teeth than in any other form of intemperance, and it is in this class of individuals where we are liable to get our death claims during the first year or two of the policy.

Again, being such an ideal citizen and so prominent, and applying for such a large amount of insurance, the examination is often not made under the most favorable circumstances for thoroughness. He is examined in his office and his heart is usually not tested by exercise nor examined in both the upright and re-

clining positions. Hence, a mitral lesion can readily be overlooked, and the systolic murmur of an aortitis not be brought out. The examiner, the agent, and even the Home Office are overawed by so much greatness in an individual, and the policy is written with undue haste.

I also think that our present medical blank is at fault with regard to arrhythmia. We ask only for pulse rate and rhythm. Now, pulse rate and rhythm are not the same thing as heart rate and rhythm, for the pulse rate may be 70, and the ventricular rate over 100. I believe that we should ask also for the rate and rhythm as elicited at the apex of the heart.

I think that Dr. Wilson has brought to our aid a very valuable diagnostic point in emphasizing the importance of studying the individual blood pressure beat through a period of ten beats. If arrhythmia is present, it will certainly be thus disclosed.

It reminds me very much of a young dentist that located in a certain city and his clientele after a little while showed such an improvement in their condition of the teeth that it became talked about extensively. Some dentist went to him and asked him why he was getting such better results than the other dentists. He said, "Well, I instruct my patients not to clean their teeth, but to clean each tooth." And that's what Dr. Wilson suggests about our paying attention to the individual blood pressure beat.

To show you how we have been wandering in the past somewhat in the dark, I looked at our code numbers with regard to the reports concerning the heart. There are 29 of them and 16 of them mention heart murmur. Now, of course, we know the importance of investigation when a heart murmur is reported, but

isn't the opposite also true that we might have other abnormal signs present, and if the report comes back that there is no heart murmur that we think then that the case is all right? Also in our pulse reports, we have 3 reports regarding intermittent pulse and 3 reports regarding irregular pulse. Now, I don't think that the cardiologists like Dr. Lambert ever speak of intermittent pulse or of arrhythmia without mentioning the type. How can you say that an irregular pulse is under 5 per minute or over 10 per minute or more? So it looks to me that in order to get a report on these difficult cases that we must make up our minds that we will have to pay more than we are now doing to obtain a true picture of the arrhythmias.

I want to say that I asked Dr. Dewees, Assistant Medical Director, to bring over a few tracings we have taken—electrocardiograms. After the meeting, if anyone would like to see them, it will give you some idea of what can be done at any Home Office. I thank you. (Applause.)

Dr. Daley—There was a man once who was writing or making up an encyclopedia concerning animals and when it came to elephants, he thought it would be a good idea to obtain the opinion of different nations concerning elephants, so he asked an Englishman, a Frenchman, a German and an American to write about elephants. The Frenchman wrote about the love affairs of elephants, the Englishman wrote about hunting elephants, the German wrote about the use and efficiency of elephants and the American wrote an article for bigger and better elephants. (Laughter.) We must not overlook the fact—and it has been brought out here so clearly today—that we need a bigger equipment and better examinations.

Dr. Wilson, have you anything more to add?

Dr. Wilson—Mr. President and Members: I think very often a diagram gives you a better idea of something than a picture of it and I believe that an idea of the heart muscle can be better given in the form of a diagram, to compare it to a cable, a telephone cable, of which there are 72 wires. If all the 72 wires are sound, there will be an impulse along each when the proper key is struck. If, however, one fails, it is in a measure unimportant. The failure may be due to a temporary condition in that wire or it may be due to a permanent breaking of that wire. The important thing, however, is whether that break is something which is eventually going to destroy the cable or not. That is our problem.

I don't think that we really appreciate thoroughly what Dr. Lambert pointed out, namely, the constant slight damage that is done to the heart, especially at the older ages. I don't think any of us appreciate the fact of what rheumatic fever does and how rheumatic fever can exist, can run its course, do damage to the heart and yet the patient have no idea of it. I read an article reporting cases from the Harriet Lane Hospital of the Johns Hopkins Hospital, report of sudden deaths in children, one of which came to autopsy. The child gave no history of rheumatic fever and yet there were numerous Aschoff Bodies in the muscle. These, of course, in healing generally give fibrosis and break that wire in the cable. That applies all the way through life.

I think Sir James Mackenzie blazed a way for us in his, you might say, final appeal in the study of symptoms preceding or getting changes. I think we are doing the same thing in a measure in emphasiz-

ing the importance of slight physical changes in those apparently healthy and giving us an idea of what the future holds. In bringing this method out, it was brought out simply as a means of teaching students. I for years past have been a great believer in bedside teaching, believing that the best physician is a man who could make a positive diagnosis without the higher court of appeal, the laboratory. The laboratory should be used as a final court of appeal. Consequently, I tried to teach students to learn all they could with the simple instruments that they carried in their bags, and as an outgrowth of this teaching, I found that I was able to recognize a good many of these irregular hearts, to give value to them. As a result of that, I brought this question before you.

I don't think too much stress can be laid upon one point of Dr. Lambert's paper, namely, the question of the importance of recent mild infections in our applicants for insurance over 40. Influenza or bronchitis in a man of 20 is a relatively mild thing; the myocardium is only slightly damaged. In a man of 40 or 50 who gives a history the year preceding of having been laid up for two weeks, perhaps with influenza, it is an important thing with us because we do know that there is a certain amount of damage done to the myocardium in that fact and we should really consider it and consider it of some importance.

Now, as to the value of the electrocardiogram, personally I don't think there is any question of its value. I think the least value of it is where we get most information at the bedside, namely, valvular lesions. We get the left side predominance, which, of course, we expect; otherwise the record is in a measure normal.

We get its greatest value, however, in the cases where we practically suspect nothing. We get changes in the T wave, the low voltage, etc., all of which are important, and I don't think there is any question that we get something of inestimable value in our applicants of 50 years of age and over and I think the money would be well spent where the amount of insurance applied for is large.

In taking up the points brought out in the discussion, I do think that certain things should be borne in mind. I don't think any of us appreciate the importance of the question of past hypertension. Past hypertension is important. Many have noted the changes in the arteries in cases where there was normal tension and where a thorough study of the history of the man has shown hypertension in the past.

Another thing which we do not bear in mind is the fact that not only are there latent cases of rheumatic fever, but that it is very often a progressive disease. Mackenzie in a report in the Journal of Diseases of the Heart showed that in the cases studied showing no valvular lesion at or near the acute attack, if followed, in three of those cases there developed after five years definite signs of mitral stenosis and we all know that in mitral stenosis there is a worse problem and a great liability to the arrhythmias especially fibrillations, so that the failure to find much evidence after a year or even two years after rheumatic fever does not in any way indicate the absence of cardiac damage.

In regard to heart enlargement, as I just said before, I am a great believer in bedside teaching, and Dr. Olsen, whom you remember very well, used to lay stress on the fact that the most important sign, so far

as prognosis is concerned in valvular heart lesions, speaking now broadly, was the size of the heart, so that it is not a new thing. It is an old thing that was confirmed by every clinician in the days long preceding that of Dr. Olsen.

To come back just a second in regard to irregularities. There was a case that was gone over by two or three of the staff and gone over most carefully and was seen by one consultant. He had put in a claim in regard to lung disease and had to be seen by two consultants and came up to me for examination. I found his lungs to be practically normal in every respect. Took his blood pressure and in taking it I found that he had a typical pulsus paradoxus of about four millimeters variation in the pressure in inspiration and in expiration. Checking that then with the tape measure in regard to his chest, I found that his total expansion of the chest was only an inch and a half, conclusive evidence of emphysema. The other physicians had missed it, but the other physicians didn't use a tape measure. There is an example of what the blood pressure can do even outside of the heart.

I certainly want to thank Dr. Lambert for his paper as one which I have enjoyed intensely and I think that the recognition of these coronary cases, the recognition of these cases of myocardial disease, is most important in reporting results from our standpoint. Such cases, of course, are not insurable, but I think one of the best things you might say from the human side which is brought out by Dr. Lambert is the fact that there is a sort of accessory circulation and that we can tell an occasional patient with an angina pectoris

that he can recover, and I think it has been demonstrated that we always receive cases during and following an attack and possibly dying from some intercurrent infection. I thank you. (Applause.)

Dr. Daley—Is there any member present who wishes to ask a question or make any further remarks on this subject?

Dr. Cragin—May I say just a word? I want to report a little experience which we have had in the Aetna Life Insurance Company with the use of the electrocardiogram. In the last two years, we have had 225 electrocardiograms sent in to the Home Office on cases in which we were suspicious of arrhythmia. I was accused in Boston the other day of having Scotch blood and so I have to carry this on by saying that the electrocardiograms have not cost the Company any money. They are all done at the expense of the applicant, and in connection with this I may say that we have had several very complimentary letters from the applicants for calling their attention to the value of the electrocardiogram.

We use the electrocardiogram in cases of rapid pulse, slow pulse, and of the arrhythmias. We take the ordinary extra ventricular systoles where everything else is perfectly all right at standard rates. We do not take heart blocks and a few cases of that sort.

There is one thing more that I want to say. We are not intelligent enough as yet to use the electrocardiogram in conjunction with the valvular diseases that Dr. Wilson just spoke of. We hope that sometime we may come to that.

I would like to get clear in my mind, if Dr. Lambert will be so good, the question as to whether or not after

one attack of angina he has some—I won't say infallible—method of picking it up on the electrocardiogram. Is it not possible in those cases for a man, shortly after an attack of angina, to show a perfectly normal electrocardiogram? I thank you.

Dr. MacDonald—Before closing, I would just like to ask a question. Dr. Rogers mentioned the electrocardiograph and mechanical instruments for measuring the pulse and the heart rate and conditions. As long ago as 1872-3 I had the privilege of studying at St. Thomas' Hospital in London, and being in charge of an instrument for recording the heart and pulse beats, et cetera. It was done by means of clock work and a needle impinging on smoked glass. That is an old affair. I just want to mention it because it appears to have been forgotten and I found that it was not suitable because I could not add it to my kit as a general practitioner, and the Chairman himself said that in the United States of America their comment on elephants was that they wanted larger and stronger elephants.

I remember the comment that the late Dr. E. M. Hodder, a distinguished surgeon of Toronto, made about instruments in the kit of the medical man. This was to the medical students. He said: "You know, boys, the larger the ass the bigger the burden," intending, of course, to imply that by cultivating our own senses we could do good work which could be helped by mechanical means.

I wish to take this opportunity of expressing my gratitude to those who have given us such excellent papers and also to compliment Dr. Lambert and to say how pleased I am personally to meet him. I had the privilege of receiving many courtesies from his father in the Equitable Life Insurance Company. Thank you.

Dr. Daley—Thank you, Dr. MacDonald.

Dr. Lambert—I will answer the last question first. The electrocardiogram has its own value and its own limitations. The polysphygmograph, of which the doctor just spoke, is still of great value, so much so that hitched on to my electrocardiograph instrument in Bellevue is a polygraph so that I can take on the same film a polygram or an electrocardiogram or both together at the same moment. That will tell you of how much value I think it still is.

Now, as to what Dr. Rogers said, to get the real prognostic value of the electrocardiograph will require either many more years of study or the intensive study of some large mass of records from your own point of view. We have the point of view of what is the matter with the man and what can you do for him as far as the clinician is concerned. You have the point of view of what is the matter with the man, how much I can bet on whether he will last or not. You also have the point of view of the prognostic significance of things. You know perfectly well that certain conditions do not permit you to make a bet because you cannot risk it. You often could make a bet on many a man which looked to you a risk and yet which experience taught you that it was a past occurrence in his life and would not recur again.

As I grew up in my medical work, I could not for many years understand the uncanny knowledge that my father had in prognosis and was often mystified and I think you will all bear me out that he would take people that looked like poor risks and they would justify him by longer life. I asked him one time and he smiled and said: "Oh, look to his habits."—and that taught me that it was in the habits of a man through which arteriosclerosis came and he saw it and knew it.

Now, that also taught me in dealing with the electrocardiogram of the difference between the irregular pulse and the intermittent pulse. The irregular pulse comes from fibrillation and in that fibrillation there is the practical differentiation that the number of beats at the heart is different from the number of beats at the wrist and there is what you call the pulse deficit which guides you that way. An intermittent pulse is one that has the interpolated lack of beats or heat, and those may be simply significant of intoxication and not of cardiac degeneration, although in the majority of instances they probably are degeneration. In those hearts, as you listen to them, there is a perfectly definite rhythm of that heart beating and then every now and then at whatever may be the number of beats, there is an extra beat or it seems to miss a beat, and oddly enough, if you count the heart for a minute or more, you will find they come with a curious regularity of every third beat, every seventh beat or whatever beat it may be.

Now, clinically, I find that the two things that cause more intermittence in the heart are the intoxications of coffee and tobacco, and with the tobacco heart there comes a curious little double sound in the first sound of the heart. As I asked people who were apparently well and yet worried of this consciousness of intermittence, "How much do you smoke; how much coffee do you drink?" I usually find that they do overindulge in one or the other. Now, simply because I don't smoke—because it knocked my heart out—is no reason to deprive other people of that pleasure. They can take their choice, but there is no question that in young hearts in which a disease does not seem to be present and the functional test

of it is perfectly good in those hearts their intermittence is an intoxication and it frightens them, but I think they are out of luck rather than in danger. However, in an old heart, an intermittence may be a sign that he is in danger.

With regard to Dr. Rogers' idea of the electrocardiogram that you might judge of its value in your own work, I will say this: Since 1912, when I first put an electrocardiogram in Bellevue—I put it in out of my own pocket; there was no use in asking the City Fathers to pay for it—I have 14,000 or 15,000 records. Those are my own. They're cross-catalogued. There is a card catalogue with them and there is an excellent and accurate and valuable record in Bellevue Hospital of all patients coming in. If at any time you gentlemen wish to have a committee which will study the value of the electrocardiogram to you, my records are at your service. (Applause.) With that is the knowledge that is in my own head that I can't give out and that goes with it. (Applause.)

The electrocardiograph has nothing to do with murmurs. When I first bought it, I thought it might have and I studied sphygmographs and polygraphs, but I could add nothing from them in the study of murmurs. I studied the micrograph and could make nothing practical out of that as far as murmurs were concerned. The electrocardiograph is a differential change in the electrical activity in the heart muscle as it contracts and it has its own peculiarities and deviations caused by the degenerations or the breakdown of the relationship between the cardiac bundle through which the activity of the heart occurs and the mass of contracting tissue through which the cardiac function is performed, and if you will think

of it as two systems, one to keep it going and one to perform its work, you will straighten out in many ways the activity and lack of function in the heart. As long as the myocardial contraction can take place, the heart will function because then the ventricle will go on even if cut off from the auricle, but with degeneration of the myocardium and diminution of its contracting power, occurs loss of efficiency in the function of the heart. Now, with few exceptions, it is the contracting mass of muscle in the heart which is degenerated by disease. The scientific work of Evans and Krogh and others in England has shown that the longer the heart muscle is stretched like the systemic muscles, the more power it has when it contracts but when it degenerates, it stretches but lacks the power to contract and therefore it stays stretched and you have cardiac dilation. The degeneration of its fibers prevents its return back into its compact contracting mass. A marathon runner at the end of his race, has a smaller heart than he had at the beginning because the contracting power goes on to such an extent. In watching the six-day bicycle riders at Madison Square Garden, I was struck by the tremendous power of their hearts and the slowness of their pulses. The individual beat was perfectly competent to empty that heart of the blood mass brought to it. The heart out of condition cannot empty itself and clean up with each beat and give the necessary increased amount per minute. It must, therefore, increase the number of beats per minute to get out the minute volume and do the work and supply the required amount of oxygen to the tissues. A heart in condition is capable of giving the required increase per beat; out of condition it must try and make up for the lack

per beat by increasing the number of beats per minute and that is the value of a rapid pulse as giving you a hint that the heart is out of condition and a heart that may be today out of condition may easily be brought into condition by judicious persistent training.

Chronic rheumatism is really a fact. I did not formerly believe it. Von Glahn has shown that rheumatic fever with Aschoff Bodies is really a chronic disease with recurrent attacks affecting the heart and Aschoff Bodies are the evidence of a definite disease organ of the body except the brain, and he is looking now to see if he can find it in the brain. It is really, as the discussion at the American Association of Physicians last spring showed, that the Aschoff Bodies are the evidence of a definite disease that is found generally throughout the body. That you will hear much more about in the future.

Dr. Olds asked me if I would say what I thought of hypertension and the value of the record of the actual number of millemeters in using the sphygmograph. If a man has a difference between the diastolic and the systolic of 40, he has a normal pulse pressure and in my experience it makes but little difference how low his systolic is provided the diastolic gives him the 40 pulse pressure, the circulation is then well kept up. I have seen one patient of mine, a very active person, who carried a pulse pressure of 40, but his systolic ran from 79 to 82 regularly. When he smoked too much, it ran up to 160. When he found that it poisoned him he quit, his pressure dropped back to 82. He was an active person, weighing about 180 and was a companion of mine on fishing trips, carrying canoes and heavy loads with no effort and

in perfect contentment and with no loss of breath and with a low pressure that frightened everyone, he was better off than those that had a higher one.

As the spasm in the arterioles occurs, whether from infection or from poisoning, such as uremic poisoning, etc., both systolic and diastolic pressures rise. If the diastolic in my experience gets up above 110, it often comes from reflex of the kidneys and rarely will you find the kidneys uninvolved if the diastolic is above 120. The systolic may go as high as anything above 160 and you may have a pulse pressure of 100 and find that in constipated people who carry a putrefaction and a fermentation instead of a digestion, if you clear out their colon the systolic pressure will fall and they can go on with great comfort. I had three patients with attacks of angina pectoris and of the type that came with high tension. They all of them had tensions above 200, but low diastolic. They all were of the fermentation colonic type. The angina disappeared and their attacks disappeared when I made them clean out their bowel and disinfect it with the acidophilus milk or with the mixture of salol and castor oil in small doses and continuously applied.

I do not feel we should worship too much any instrument. I remember a patient who had a pressure of 279 with attacks of angina, which I succeeded in improving. Her brother came to me with a pressure of 250. Her sister came in and said: "I wish you would take my blood pressure." I said, "Certainly. Where was it when you last had it taken?" "Three hundred." "Three hundred," I said, "how long ago?" "Nine years ago," she replied. I said, "That's interesting." I took it. It was 309. That was twelve years

ago, and she is still alive. In other words, that was a family peculiarity. Every one of that family apparently had it and managed it. I do not know what the cause of it was. I accepted the fact.

There is a cardiac murmur that I think most people forget that does no injury, and that is a pulmonic murmur, systolic in time, that disappears on deep inspiration. It is found in young persons more than in older people. It is found in young children probably most frequently. It means a short lung and not a diseased heart. I remember one time that at Cornell they wrote to me in much distress. They had a splendid crew and three of them had a loud pulmonic murmur that bothered them. Should they allow these young men to row? I asked them to find out if it disappeared on inspiration, and if so, to let them row, that they simply had not developed their lung. They wrote me that they had and they thanked me and they let them row and they won their race. I have often found it especially in athletic young men, and it is a sign of a powerful, vigorous heart, not over developed, which is in good condition to accommodate itself to any emergency and is not a risk, but I have seen many a splendidly formed man thrown out of the army or navy because of that murmur.

Question—Suppose it was found at age 50 and disappeared?

Dr. Lambert—I would still bet on his health and let him go.

Dr. Rogers—Let them row?

Dr. Lambert—Yes. (Laughter.)

Dr. Lambert (cont.)—That, I think, is a congenital condition of a shortened lung and we should not hold that against them. I have never seen them where

their circulation with that murmur was affected because of that condition, and that is the final test.

I do not think there is anything more except to permit me to thank you for your kindly reception and to express to you the pleasure that I have derived from coming here this morning. It has been a genuine and a keen pleasure. (Applause.)

Dr. Daley—Dr. Rogers.

Dr. Rogers—Mr. President, Dr. Lambert in offering the use of his records in the sphygmograph has raised in my mind a question which has during this meeting come up from several other angles about which I should like to say a word.

I am not so sure that much of the material that falls into Bellevue will be of service to us, but some of it would, and the records of the Bellevue clinic multiplied by 100 gives us a world of information. It is of very great promise and if it should not happen in my time, I hope that the younger men here will have that in mind as something that we should pursue in the future for the lasting benefit not only of life insurance but of clinical medicine as well.

May I say in conclusion a personal word, and that is that Dr. Lambert is so reminiscent of his father that it took me back 30 or 35 years when as a neophyte I was brought in contact with the splendid men who were then leading life insurance medicine, of which his father was a distinguished member. (Applause.)

Dr. Lambert—Thank you, gentlemen. There is this, Dr. Rogers and gentlemen, the statistics and your own records show that the deaths from heart disease are increasing because the infections from which men usually die are diminishing and all men must die and therefore there is more chance to die of heart disease than

used to be the case. An increasing number of people come into the clinics and hospitals complaining of heart disease up to the age of 65. After 65, the death rate from heart disease increases in the hospitals, although the admission for heart disease diminishes. They come in not for hearts; they come in from the intercurrent diseases of influenza, bronchitis, pneumonia and similar conditions and those who care for them realize that while they come in with bronchitis, this, that and the other thing, they die a cardiac death and are recorded as cardiac deaths.

In the hospital electrocardiograms you will find the evidence of damaged myocardiums, and in my experiences, I have taken again and again and yet again electrocardiograms of men who simply had diminished function of myocardium in order to see whether or not the electrocardiogram would give any clue. There was one question I didn't answer before, whether after angina pectoris the electrocardiograms show anything or not. It depends altogether from whence that attack of angina came. Angina is of two types: One comes from aortitis of the first portion of the aorta and the other from the cardiac non aortic coronary circulation. As I pointed out in my paper, the same reflexes run down through the ascending aorta as in the rest of the heart, and if the cause of angina is there, the electrocardiogram may show nothing whatever.

When a man gets a pain from an angina of aortic origin, he stops short and he can hardly breathe or hardly dare to breathe and he never treats it with contempt. He doesn't say that he had a slight pain but he has the greatest respect for it and he sits still just as he was and doesn't move. It's quite typical of

it. I have seen in the angina coming from the cardiac coronaries, the man walking around the room angry and profane because of the pain. Aortic angina is also accompanied by hypertension and coronary angina frequently shows low tension.

Those are the differentiations, and the reflexes of angina, in my opinion, come from the disturbance in the mechanism of the reflexes of your constrictor and your dilator. That is another story, but when that is disturbed, you get your attacks of pain. Relieve that and they cease. The reflexes start from the sensory nerve endings in the walls of the blood vessels themselves and only through nerves can you get pain, not through muscle. Work that out and you have the answer. The operations on the sympathetic nervous system and the vagal system that have been performed in the last few years show that any one of a half a dozen operations will stop the attacks. The disease in the heart goes on, but the attacks of pain are stopped. Therefore, the most probable explanation is that the operations have in different ways broken the paths of the reflex arc. I could prove that to you by a longer discussion, but a man with angina is a perfectly treatable person.

One of the distinguished pathologists at one time had attacks from which no one thought he would recover. I walked with him in his garden recently and I know that he has been free from all pain and angina for several years. Angina is in some instances an amenable and curable condition; in others it is not; and it means that you are dealing with a vascular and reflex action in your vegetative nervous system and there lies your secret. You can do a great deal for angina. I wish you could do as much for myocardiac disease. (Applause.)

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Dr. Daley—Gentlemen, I suggest that this Association show its appreciation for the valuable ideas and facts which Dr. Lambert has presented to us by a rising vote of thanks. (Every one stood up.)

Dr. Daley—We are always interested in tuberculosis because it enters so largely as a factor in our deaths and disability claims. I have here the disability and death claims of the Equitable for the year 1927:

DEATH CLAIMS—DOMESTIC AND FOREIGN—1927

No. of all Claims	No. due to Tuberculosis
Allowed	
10,224	490
No. of all First Year	No. due to Tuberculosis
Claims Allowed	
477	18

Tuberculosis in Relation to Disability Claims  
First nine months 1928.

No. of all Claims	No. due to Tuberculosis
Allowed	
1,697	327
No. of First Year	No. due to Tuberculosis
Claims Allowed	
382	45

I firmly believed that a man who had had tuberculosis and who had been discharged as an arrested case would show among workers, especially clerical workers, a lessened degree of morbidity than that among the average. I was under the impression that men who had gone through the necessary measures of health in order to arrest the tuberculosis would have learned how to take care of themselves.

I asked Dr. Knight to prove this. Dr. Knight, will you tell us what the proof shows?

MORTALITY, MORBIDITY AND WORKING CAPACITY OF TUBERCULOSIS PATIENTS AFTER DISCHARGE FROM THE METROPOLITAN LIFE INSURANCE COMPANY SANATORIUM BETWEEN 1914 AND 1927.

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and

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METROPOLITAN LIFE INSURANCE COMPANY.

The Sanatorium at Mount McGregor, built by the Metropolitan Life Insurance Company primarily for the care and treatment of its employees who become ill with tuberculosis, has been in operation since November, 1913, and from that date until the end of 1926, 1,448 patients with pulmonary tuberculosis were discharged alive from the Sanatorium. Of these 946 were males and 502 females. Further, 833 of them were diagnosed as incipient on admission, 509 as moderately advanced and 106 as far advanced cases. Of these 1,448 patients discharged alive, the condition on discharge of 1,294 was classified as apparently arrested, quiescent or improved and of the remaining 154, as unimproved or progressive. This distribution varies largely, of course, according to the condition on admission. Of the 833 persons whose condition was incipient on admission, only 23 were discharged as unimproved, but of the 509 cases moderately advanced on admission, 79 were un-

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improved on discharge and of the 106 far advanced cases, 52 or practically one-half were discharged as unimproved.

TABLE 1.

Number of Tuberculosis Patients Discharged Alive from Sanatorium of the Metropolitan Life Insurance Company, 1914 to 1926, by Sex, Stage of Illness on Admission and by Condition on Discharge.

Stage of Illness on Admission	BOTH SEXES		MALES		FEMALES	
	Number total cases	% of total cases	Number total cases	% of total cases	Number total cases	% of total cases
<b>All cases combined:</b>						
Total	1,448	100	946	100	502	100
Improved at Discharge	1,294	89	852	90	442	88
Unimproved at    "	154	11	94	10	60	12
<b>Incipient on Admission:</b>						
Total	833	100	500	100	333	100
Improved at Discharge	810	97	489	98	321	96
Unimproved at    "	23	3	11	2	12	4
<b>Mod. Adv. on Admission:</b>						
Total	509	100	372	100	137	100
Improved at Discharge	430	85	323	87	107	78
Unimproved at    "	79	15	49	13	30	22
<b>Far Adv. on Admission:</b>						
Total	106	100	74	100	32	100
Improved at Discharge	54	51	40	54	14	44
Unimproved at    "	52	49	34	46	18	56

### I. MORTALITY

These 1,448 Sanatorium ex-patients came from the Home Office and from the various districts throughout the United States and Canada where the Company operates. The mortality of these patients subsequent to their discharge from the Sanatorium has been compared with the mortality of all the employees

of the Company insured by Group Life policies during the same years. The 1,448 Sanatorium cases lived a total of 9,461 years from date of discharge to the anniversary of discharge in 1927. There were 199 deaths in the group. On the basis of the experience of the combined Home Office and Field Forces, and allowing, of course, for the differences in age composition, we should have had 53.76 deaths. The ratio of actual to expected deaths was thus 370 per cent, or in other words, the number of actual deaths was more than 3½ times the expected. The mortality of males discharged shows a ratio of 338 per cent and of females 474 per cent of the expected.

The stage to which the disease had advanced at the time of admission greatly influences the after mortality. In the group of 833 patients whose condition was incipient on admission, there occurred 39 deaths as against 30.14 expected or a ratio actual of expected of 129 per cent—or one-third higher than normal. The 509 moderately advanced cases show 115 deaths as against 20.97 expected or a ratio actual of expected deaths of 548 per cent—5½ times normal. Of the small group of 106 far advanced cases, 45 died as compared with 2.65 expected deaths or a ratio of 1,698 per cent actual of expected—seventeen times normal. The chance for survival was, therefore, largely determined by the stage of the disease when the patient arrived at the Sanatorium. On the basis of condition on discharge, we find that those whose condition was better than at admission, the "improved" cases, showed a mortality of 240 per cent, whereas the "unimproved" cases showed a mortality of 2,957 per cent or practically 30 times the expected mortality.

The sex of the patient also plays a part in determining the prognosis of these cases. In the incipient group, the ratio of actual to expected deaths of males is 98 per cent as compared with 209 per cent for females, or a relative mortality among females twice that of males. It appears that our men who arrive at the Sanatorium in an incipient stage have a normal mortality after discharge. This is a remarkable fact. The excessive mortality among young women is one of the striking aspects of the tuberculosis situation at present. The most trustworthy evidence seems to indicate that the high peak in the tuberculosis mortality curve for women occurring about age 20 is probably due primarily to biological factors. In the moderately advanced group, the ratio of actual to expected deaths of males is 515 per cent and that of females 698 per cent. The mortality of females in this group is thus approximately  $\frac{1}{3}$  greater than that of the males. In the group of far advanced cases also, the subsequent mortality of females exceeds that of males, but the actual ratios are not very reliable because of the few cases involved.

The comparison of the mortality of these patients who were discharged alive is shown in Table II, classified as indicated in the preceding paragraph.

TABLE 2.

After-Mortality of Patients Discharged Alive From the Sanatorium of the Metropolitan Life Insurance Company After Treatment for Pulmonary Tuberculosis, 1914 to 1926, Compared With the Mortality of Employees of the Company Insured Under Group Life Policies 1914 to 1927, by Degree of Illness on Admission and Condition on Discharge and by Sex. Experience Carried to the Anniversary of Discharge in 1927.

		MALES				FEMALES			
		BOTH SEXES		MALES		FEMALES			
Stage of Illness	on admission	Years of life	Deaths	Expected	Per cent	Years of life	Deaths	Expected	Per cent
		Condition at discharge	deaths	actual of exposed		Condition at discharge	deaths	actual of exposed	
All Cases									
Combined:									
Total	9,461	199	53.76	370	6.187	139	41.10	338	3.274
Improved	8,918	123	51.19	240	5.818	91	39.06	233	3.100
Unimproved	543	76	2.57	2,557	369	48	2.04	2,353	174
Incipient:									
Total	6,893	39	30.14	129	3.479	21	21.51	98	2.414
Improved	5,760	39	29.57	132	3.404	21	21.14	99	2.346
Unimproved	143	—	.57	—	.75	—	.37	—	.20
Moderately Advanced:									
Total	3,290	115	20.97	648	2.489	88	17.10	615	801
Improved	2,989	77	19.42	396	2.273	63	15.82	398	716
Unimproved	301	38	1.66	**	216	25	1.28	**	85
Far Advanced:									
Total	278	45	2.65	1,398	21.9	30	2.49	1,205	69
Improved	179	7	2.21	317	14.1	7	2.10	333	38
Unimproved	99	38	.44	**	78	23	.39	**	21
Far									

\* Not significant.

\*\* Ratio very large, but actual size of ratio is not significant.

## II. MORBIDITY

For the study of the sickness record of tuberculous patients subsequent to their discharge from the Sanatorium we have had the carefully kept record of the Home Office clerical employees of the Company. An analysis has been made of the experiences disclosed by these records of all employees who, after treatment at the Sanatorium, were discharged with their disease arrested or with improvement so marked that they were able, with medical advice, to go back to work in the Home Office of the Company and were in the Company's service during the years 1925 and 1926. (Thus some of them had been discharged in 1914 and some in each of the succeeding years.) For the year 1925 we have a record of 199 employees and in the year 1926, 205. They were distributed according to stage of the disease at admission and by sex, as shown in the following table:

TABLE 3

Number of Cases Included in Morbidity Study of Employees, Ex-patients of the Sanatorium of the Metropolitan Life Insurance Company in Service at the Home Office, 1925-1926.

Stage of illness on admission	Total		Male		Female	
	1925	1926	1925	1926	1925	1926
All cases	199	205	70	69	129	136
Incipient	150	153	46	45	104	108
Moderately advanced	44	46	20	20	24	26
Far advanced	5	6	4	4	1	2

The information we have taken is based on the number of whole working days absent within the two years; absences of less than one day are disregarded. We also have the number of absences. We have calculated absence rates based on a full year exposed, that is, we have taken into account the fact that some of these persons were in service for only part of the year. We have also studied the sickness record to determine the most important reasons for absence, particularly absence due to respiratory diseases and, in addition, absences among females due to genito-urinary conditions. For purposes of comparison, there was available to us the absence record of the whole clerical staff at the Home Office during these two years.

For both years combined, the male ex-patients show an absence rate of 21.4 days per clerk year exposed and the females, 42.2 days. This compares with an absence rate of 8.6 days for all males on the clerical staff during 1925 and 1926 and 13.0 days for females. Male ex-patients of the Sanatorium, therefore, have an absence rate two and one-half times and females more than three times that of the corresponding clerical groups of the Home Office. At ages under forty-five, the absence rate for male ex-patients is 14.5 days as against 8.0 days for all male clerical employees in that age group, and at ages forty-five and over, the male ex-patients have an absence rate of 40.8 days as against 12.1 for the corresponding clerical group. Female ex-patients under forty-five have an absence rate of 35.8 days as against 12.3 days for all females under forty-five and at ages forty-five and over, the female ex-patients have an absence rate of 72.7 as against 24.3 days for the corresponding clerical group.

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Absence rates vary considerably according to the stage of the disease on Sanatorium admission. Males who were incipient on admission have an absence rate of 8.8 days per year, those moderately advanced 28.8 days per year and the few far advanced, a rate of 139.3 days per year. Among females, the absence rate of those incipient on admission was 39.7 days per year and those moderately advanced 54.3 days. The absence rate of females far advanced on admission is not significant because of the very small number who were in service.

The absence rates for ex-Sanatorium patients, classified as indicated in the preceding paragraph and for the whole clerical force, are given in the following table.

TABLE 4.

Number of Whole Working Days Lost on Account of Illness Per Clerk Year Exposed, 1925-26. Tuberculosis ex-Patients Classified by Degree of Illness on Admission Compared with the Clerical Staff. Home Office cases only. By Sex and Broad Attained Age Groups.

Sex; Attained age	DAYS LOST PER CLERK YEAR Tuberculosis ex-patients				Home office clerical staff
	All cases	Incipient	Moderately advanced	Far advanced	
<b>Stage When Admitted to Sanatorium</b>					
All ages	21.4	8.8	28.8	139.3	8.6
Under 45	14.5	5.8	34.5	*	8.0
45 and over	40.8	17.2	*	192.5	12.1
<b>Males:</b>					
All Ages	42.2	39.7	54.3	*	13.0
Under 45	35.8	33.1	48.8	*	12.3
45 and over	72.7	71.4	77.7	†	24.3
<b>Females:</b>					

\* Not significant.

† No cases in this group.

We find that the young men who were incipient cases at the Sanatorium have an extraordinarily good sickness record after discharge. The time lost because of specified diseases is of interest. The group of ex-patients is not large enough, however, to make a detailed analysis of any great value. But we have studied the absence due to respiratory conditions and, for females, absence due to genito-urinary diseases as well.

In the group of male ex-patients, 67 per cent of the time lost was on account of their tuberculosis, 10 per cent on account of influenza and grippe, 5 per cent on account of other respiratory conditions, including tonsillitis and 18 per cent for all others. In the Home Office male clerical staff of the Company during 1925, 25 per cent of all of the total days lost was due to tuberculosis, 12 per cent to influenza, 13 per cent to other respiratory diseases and 50 per cent to all other causes. Considered on the basis of the number of days lost per year, the former Sanatorium male patients show an absence rate for tuberculosis of 14.4 days, 2.1 on account of influenza and grippe, 1.2 on account of other respiratory diseases and 3.8 days for all other causes. The corresponding figures for the whole male clerical staff in 1925 are 2.2 days on account of tuberculosis, 1.1 on account of influenza and grippe, 1.1 on account of other respiratory diseases and 4.4 for all other causes.

The proportion of sickness absences due to tuberculosis varies with the stage to which the tuberculosis condition had advanced at the time the ex-patients were admitted to the Sanatorium. Among males, who were incipient on admission, only 6 per cent of the days lost was due to tuberculosis as against 82 per cent among

the moderately advanced group and 98 per cent among the far advanced group. On the basis of days lost, .5 of a day was lost per year in the incipient group for this cause, 23.7 days among the moderately advanced and 136.8 among the far advanced. The respiratory diseases show a much higher percentage incidence among the incipient cases than in the other two groups, but on the basis of days lost, there is no very great difference between all three groups.

Females whose condition was incipient on admission show a loss of only 2 per cent of total time on account of tuberculosis or .8 of a day per clerk year, as compared with 61 per cent of the days lost, or 33.1 days per clerk year, among the moderately advanced. The far advanced group is too small to consider from the point of view of this distribution. Respiratory conditions, including tonsillitis, account for 19 per cent of the time lost, or 7.5 days among the incipents as against 9 per cent or 5.1 days per year among the moderately advanced. The amount of time lost on account of dysmenorrhea is practically the same for both groups, but other genito-urinary conditions were much higher among the incipient group because of a few cases of long disability.

Among all female ex-patients, pulmonary tuberculosis accounts for 17 per cent of the time lost, all other respiratory diseases, including tonsillitis, for 17 per cent genito-urinary conditions 15 per cent, of which dysmenorrhea accounts for only 1 per cent, and 51 per cent for all other diseases. On the days lost per year basis, female ex-patients show 7.1 days lost on account of pulmonary tuberculosis, 7.1 days on account of all other respiratory diseases, 6.4 days on account of genito-urinary conditions and 21.8 days for all other illnesses.

This compares with 1.0 day lost by females of the Home Office clerical staff in 1925 on account of pulmonary tuberculosis, 4.1 days for respiratory diseases, .7 of a day lost on account of genito-urinary conditions, .3 of which was due to dysmenorrhea and 6.8 days for all other causes. Among females of the whole clerical staff in 1925, 8 per cent of time lost was due to tuberculosis, 32 per cent to respiratory diseases, 6 per cent to genito-urinary conditions, of which half was caused by dysmenorrhea, and 54 per cent by all other conditions.

As was to be expected, the sickness record of these tuberculosis ex-patients is thus very much worse than that of the whole clerical staff. Much time is lost on account of recurring disability due to pulmonary tuberculosis. Although this is limited to few cases, these are of long duration. The time lost through influenza, colds, tonsillitis, pneumonia and other respiratory diseases is much greater than among the general clerical staff. Among females absence due to dysmenorrhea is about the same as that among the whole staff, but, on the other hand, long absences are to be noted, due to menopause and menorrhagia. Although the group is too small to set forth data in detail, it is to be noted that there are relatively large numbers of long absences due to degenerate diseases and neurasthenia.

As we have already noted, the males who were incipient on admission showed a relatively favorable sickness record, but those who were moderately advanced or far advanced gave a very bad sickness record. Among females the record is unfavorable throughout, regardless of the condition on admission. These results, we believe, are as good as are experi-

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enced elsewhere. Zealous efforts have been made to detect tuberculosis in the earliest possible stages. The ex-patients were kept at the Sanatorium long enough to have built up the fullest possible resistance. They are given constant, competent medical oversight from the day of their return to work. They are examined and weighed at frequent intervals, are given extra nourishment between meals when they need it, and are welcomed to the Home Office Medical Rest Rooms during work hours whenever they need to come. Thus they are watched carefully and given the most helpful of instructions to keep well. Furthermore, these results afford a stimulant and are an encouragement, rather than a discouragement, in the determined fight to wipe out tuberculosis and meanwhile to get the afflicted ones to the Sanatorium in the earliest possible stage.

The foregoing facts are presented in the following table in which are given the per cent of days lost, the total days lost, and the absence rate per year for specified diseases. This is compared with the corresponding groups for the clerical staff of the Company during the year 1925.

TABLE 5.  
Per cent of Total Days Lost and Days Lost Per Clerk Year on Account of Specific Illnesses. Home Office Employees Treated at the Sanatorium for Pulmonary Tuberculosis and Discharged as Improved. Classified by Degree of Illness on Admission and by Sex. Experience in 1925 and 1926 on Cases in Service After Reinstatement to Work, Compared with the Experience on all Home Office Employees in 1925.

Sex: Illness	PER CENT OF TOTAL DAYS LOST				DAYS LOST PER CLERK YEAR			
	Tuberculosis ex-Patients	Moderately advanced	Far advanced	M. L. I. Co. clerical staff	Total	Tuberculosis ex-Patients	Moderately advanced	Far advanced
<b>Males:</b>								
Total—all causes	100	100	100	100	100	21.4	8.8	139.3
Pulmonary tuberculosis	67	6	82	98	25	14.4	5.5	23.7
Influenza and grippe	10	29	5	—	12	2.1	2.5	1.5
Other respiratory diseases	—	—	—	—	—	—	—	—
Including tonsillitis	5	11	6	1	13	1.2	1.0	1.9
All others	18	54	7	1	60	3.8	4.7	2.1
Females:	—	—	—	—	—	—	—	—
Total—all causes	100	100	100	100	100	42.2	39.7	54.3
Pulmonary tuberculosis	17	2	61	—	8	7.1	.8	33.1
Influenza and grippe	11	12	5	23	14	4.5	4.9	2.8
Other respiratory diseases	—	—	—	—	—	—	—	—
Including tonsillitis	6	7	4	14	18	2.6	2.6	2.3
Genito-urinary diseases—	—	—	—	—	—	—	—	—
Total	15	20	1	2	6	6.4	7.9	.4
Dysmenorrhea	1	1	1	2	3	.4	.4	.7
Other	14	19	—	—	3	6.0	7.5	.3
All others	61	59	29	61	54	21.8	23.5	15.6

\* Distribution not significant because of small number of cases.

## III. WORKING CAPACITY

Another important aspect of the follow-up of cases discharged from the Sanatorium is consideration of their status as regards capacity for work. We have followed all the cases discharged from the Sanatorium down to the anniversary of discharge in 1927 and have classified them in respect to this status. Of the 1,448 ex-patients discharged alive, 879 or 61 per cent were at work or able to work on the anniversaries in 1927, 167 or 11 per cent of them were unable to work. Of these 167, 24 had been readmitted to the Sanatorium and were there on the anniversary of discharge; 143 of them were elsewhere, some on disability benefits and the rest not with the Company. Of the remainder, 199 or 14 per cent were dead; 140 or 10 per cent were living but there was no information available as to whether or not they were able to work; and of 63 or 4 per cent, we were unable to get any information whatsoever. When considered by sex, the above proportions are approximately the same. I say 61 per cent were at work. You may remember that some previous reports stated that 85 or 87 per cent were at work, but you will notice here that I say 10 per cent are living but there is no information as to whether they are able to work or not and 4 per cent we were not able to get any trace of whatever. In some previous reports, they had taken this 10 and 4 per cent as at work and I left them out.

The status as regards ability to work is, however, distinctly affected by the stage of the disease on admission to the Sanatorium. Thus 71 per cent of the patients incipient on admission were able to work in 1927 compared with 50 per cent of those moderately advanced

and only 30 per cent of those far advanced. Only 7 per cent of the incipient cases were definitely known to be unable to work, compared with 16 per cent of the moderately advanced and 23 per cent of the far advanced cases. If considered in relation to the number of those alive on the anniversary date in 1927, these differences would be even more marked, for a relatively greater number of the more advanced cases had died. Only 5 per cent of the incipient cases were dead at the 1927 anniversary, as against 23 per cent of the moderately advanced cases and 42 per cent of the far advanced cases. In 17 per cent of the cases in the incipient group, the ability to work was unknown. As to the moderately advanced group, in 11 per cent of the cases we had no information as to the ability to work, and in the far advanced group, in 5 per cent of the cases.

When considered by sex, we find few distinct differences. Of the cases on which we had information, the percentages known to be able to work are equal for males and females in the incipient group, but there is a margin in the moderately advanced group, of 9 per cent in favor of males in respect to ability to work and in the far advanced group, of 7 per cent. Disability was relatively more frequent among females, not only in the group as a whole, but in every group classified according to the degree of illness. There is no very marked difference in the percentages of those who have died in the two groups.

The facts as regards ability to work of all patients discharged from the Sanatorium from 1914 to 1926 by sex and by condition on discharge are given in the following table:

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TABLE 6.

Status as Regards Ability to Work of Patients Treated for Pulmonary Tuberculosis at the Metropolitan Life Insurance Company Sanatorium Discharged Alive 1914-1926, on Anniversary of Discharge in 1927. By Condition on Admission, and by Sex.

Sex; Status	All Cases		Incipient		Moderately Adv.		Far Advanced	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Both Sexes:	1,448	100	833	100	509	100	106	100
At work	879	61	593	71	254	50	32	30
Unable to work	167	11	60	7	83	16	24	23
Readmitted and at sanatorium	24	1	9	1	12	2	3	3
Not at sana- torium	143	10	51	6	71	14	21	20
Ability to work								
unknown	140	10	97	12	39	8	4	4
Dead	199	14	39	5	115	23	45	42
Unable to trace	63	4	44	5	18	3	1	1
Males:	946	100	500	100	372	100	74	100
At work	575	61	356	71	195	52	24	32
Unable to work	98	10	36	7	47	12	15	21
Readmitted and at sanatorium	17	2	7	1	8	2	2	3
Not at sana- torium	81	8	29	6	39	10	13	18
Ability to work								
unknown	106	11	70	14	32	9	4	5
Dead	139	15	21	4	88	24	30	41
Unable to trace	28	3	17	4	10	3	1	1
Females:	502	100	333	100	137	100	32	100
At work	304	61	237	71	59	43	8	25
Unable to work	69	13	24	8	36	26	9	28
Readmitted and at sanatorium	7	1	2	1	4	3	1	3
Not at sana- torium	62	12	22	7	32	23	8	25
Ability to work								
unknown	34	7	27	8	7	5	—	—
Dead	60	12	18	5	27	20	15	47
Unable to trace	35	7	27	8	8	6	—	—

SUMMARY AND CONCLUSIONS

1. Patients discharged alive from the Sanatorium of the Metropolitan Life Insurance Company, taken as a group, show a subsequent mortality more than three and one-half times that of the Company staff. The mortality ratio is greater for the more advanced cases, ranging from 129 per cent for cases incipient on admission to the Sanatorium, to 548 per cent for moderately advanced and 1698 per cent for the far advanced. Male ex-patients have a better subsequent mortality than females, and male patients classified as incipents on admission have shown subsequently a normal mortality.

2. The analysis of the morbidity records shows that ex-patients of the Sanatorium in service during 1925 and 1926 have an absence rate on account of sickness, three times as high as that of the Home Office clerical staff. The record of females in this respect is worse than that of males. Furthermore, as would be expected, the absence rates increase with age and with the severity of the disease on admission to the Sanatorium.

3. Recurrent disability due to pulmonary tuberculosis and other respiratory diseases account for most of the time lost among males and for a very large part of the time lost among females. There are numerous cases of disability of long duration.

4. As regards ability to work following discharge from the Sanatorium, 61 per cent of all cases discharged from 1914 to 1926 were at work or able to work on the anniversary of discharge in 1927; 11 per cent were unable to work; 14 per cent were dead, and the rest were either unable to trace or to find out whether they were able to work, even though we knew they were liv-

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ing. As would be expected, the record of those who were in the more advanced stages of tuberculosis on admission, is much worse than that of the incipient cases. The record of males as regards ability to work is much better than that of females.

Dr. Daley—Gentlemen, this work which Dr. Knight and Dr. Dublin have presented to us represents the collection of a tremendous amount of data. The Metropolitan had this at hand, but it is difficult for us to conceive of the work that it must have taken in assembling and correlating this data. I sincerely regret that the results of this investigation are so unfavorable to the arrested tuberculosis cases.

We have the paper of Dr. Battle here and you have all read it, but I am going to ask Dr. Battle if he will not come up and make a few remarks.

Dr. Battle—Mr. President, in re-reading my paper, I thought possibly that I had made the impression that I paid very little attention to tuberculosis contagiousness. I just want to correct that impression if such does exist for I do not minimize for a moment the contagiousness of tuberculosis when there is a suitable source existing and I have investigated about 1474 families, one of the members of which was applying for insurance.

Now I admit that the Eskimo is being decimated by tuberculosis since the white man has gone up there to live with him and the same thing obtains with inhabitants of interior Africa; also the soldiers that are brought over by France and England from Africa show a great inroad made by tuberculosis. However, my paper was dealing principally with our own people, some of whom are applying for insurance, and I have been

investigating along that line and I am convinced that we can be more liberal than we have been in the past when there has been some association with tuberculosis cases.

I find that since 1838 the mortality from tuberculosis has been on a steady decline, and while some observers do not believe in inherited immunity, I can eliminate, it seems to me, everything else but immunity and I believe that our people are now establishing an immunity and establishing it very rapidly regardless of the treatments that are being pushed so vigorously for the cure of tuberculosis at the present time, because there is very little difference in the ratio of the increased mortality now and prior to 1907 when this propoganda was started—so that I am a firm believer in an inherited immunity.

## TUBERCULOSIS FROM AN INSURANCE VIEWPOINT

J. T. J. BATTLE, M. D.

*Medical Director Jefferson Standard Life Insurance Co.*

Upon investigating some statistics in regard to the mortality from T. B. in married couples and noticing the great discrepancy between different observers, I decided to keep a record of the history of every applicant in whose family there had been a death from this disease.

Realizing that so many people are disposed to evade giving T. B. as a cause of death of any member of the family, there is no question but that the histories compiled are correct though many may have been missed on account of such evasion. Only T. B. of the lungs has been considered.

Dr. E. Ward, Officer of South Devon, England, reports his findings that out of 156 cases in which the mate of a T. B. husband or wife was examined, 91 were found to be tuberculous, 16 suspects, and 49 negative, or 58% T. B., 10% suspects and 32% negative.

Dr. Henry Lee Barnes of the Rhode Island State Sanatorium says that the histories of 229 consecutive widowed patients admitted to this institution from 1905 to 1921 show that 93 or 40% lost their consorts by death from T. B., a mortality over three times that of the married people of the community.

Very high is the report of Dr. Arnold Minnig of Denver, whose analysis of 6,000 dispensary cases of

conjugal T. B. showed that when one of the consorts died the mate was infected in 50% of the cases, and a mortality of 16.8%. In contrast to these, Fishberg gives 3%, Weinburg 5.9%, Ludwig Levy 2.8%.

Some seeming discrepancies in my own figures are explained by saying that in the first histories only the husband and wife were taken, and later the children involved were recorded.

In my investigation there have been found 86 cases in which both consorts have died and not including these there were 1393 cases where one mate died, making 1479 cases and 86 deaths which gives 5.8% mortality. Of the 86 cases, 11 of the mates died within the first year, 7 in the 2nd, 11 in the 3rd, up to and including the 5th year, 41 of the mates had died. The remaining died as late as the 22nd year. 51% of these were over 45 years old at death, doubtless chronic cases, and might have contracted the disease at the same focus as No. 1 did. To call these cases contagious it does seem necessary to prove that consort No. 1 contracted it by contagion or the contagious theory is weakened.

In 26 of the families in which both consorts died, 19 had 81 children and there were no deaths. The remaining 7 families with 31 children had 9 cases. One of these had 3 cases in 6 children. These 26 families, 112 children and 9 cases, give a mortality of 8.4%. This is rather too small a number to be of much significance.

Husband died of T. B., wife living and well or dead of some other disease, there were 184 families with 927 children and 34 cases of T. B., a mortality of 3.6%, 16 boys and 18 girls.

Wife died and husband living and well or dead of

some other disease, there were 340 families 1692 children, 65 cases 3.92% mortality, 27 boys and 38 girls. Some interesting figures were developed in this study, *i. e.*, in 527 families in which there was a case of T. B. but neither father or mother was infected, in 249 of these representing 1761 children there were 267 boys who died of T. B. and no girls. In 210 families in which there were 1520 children, 242 girls died of T. B. and no boys. In 34 families with 242 children, there were 75 cases where one or more brothers and sisters died. In 29 of these families, only one brother or sister died. One family 2 brothers died. Two families 2 sisters died. One family 3 sisters died. 32 cases T. B. within 2 years, 43 more than 2 years.

In Ernest G. Popes mathematical investigation of the important bearing that assortative mating has upon this subject, which he had not completed at his death but has since been carried out by Karl Pearson, F. R. S., he concludes that "Assortative mating probably accounts for at least two-thirds infective action for not more than one third of the whole correlation observed in these cases."

From the foregoing figures it does seem that Insurance Companies are dealing with a different class of people from those who visit free dispensaries and State institutions, that this class more nearly represents the average class, and again that the greatest cause of T. B. is an inherited tubercular diathesis and the ubiquitous T. B. bacillus. It does appear that massive doses of the bacilli will bring down the strongest in exceptional cases. It also seems that the improvement in the mortality which has been going on since 1838 is due to inherited immunity.

Doubtless it is a mistake to alarm the people by constantly advertising that T. B. is a very contagious disease, for this will bring on Phthisiophobia to such an extent as to be really depressing to a large part of the population and this mental depression will bring on physical weakness, which is a fertile soil for T. B. invasion.

It is rather remarkable when it is noticed the very large number of children in these families. It brings up the question, does T. B. add to the fecundity of the people?

We should as physicians and organizations inculcate general sanitation for general health's sake. I believe that many safe applicants have been unnecessarily postponed on account of T. B. association.

It appears that the greatest good we can do is to establish sanatoriums for the treatment of T. B. children. A child cured of T. B. is very probably immune to T. B. in after life and passes to his or her children immunity to a certain extent and in this way we will be ultimately protected from T. B.

Dr. Ordway—Mr. President and Gentlemen:

The thing that immediately arrests attention with Dr. Knight's figures is the low percentage of far advanced cases of pulmonary tuberculosis. This is the result of an intensive campaign carried on by the Medical Division of our Home Office and my predecessor, Dr. Howk, to get the incipient cases to the sanatorium. Last year we admitted 38.5% incipient pulmonary cases, 34% moderately advanced, and 19% far advanced. These efforts have had a great bearing on both the general mortality and morbidity rates by reason of the elimination of the advanced cases which

markedly reduce the total averages. Drolet, investigating the admissions to 176 institutions in the United States, found only 16% in the incipient stage, while 34% were moderately advanced and 50% far advanced. No preference is made in the cases admitted to our sanatorium—all are accepted as received, regardless of the stage.

One reason for the better end results of our discharged sanatorium patients is found in the longer period of treatment offered our cases. On an average our incipient cases spend a period of six months with us, the moderately advanced cases ten months, and the far advanced one year and eleven months, whereas Drolet, in the study previously mentioned, states that 17% remained in institutions less than one month, 24% from one to three months, 22% from three to six months, 16% from six to nine months, and 21% nine months or more.

Dr. McSweeney has prepared a very workable table relative to the mortality experience in discharged sanatorium cases. He found that in the incipient cases the mortality was six times the expected, sixteen times in the moderately advanced, and thirty-eight times in the far advanced. The figures given by Drs. Knight and Dublin show a very favorable comparison—in our incipient group one-third the mortality of the expected,  $5\frac{1}{2}$  times in the moderately advanced cases and 17 times in the far advanced. This is explained, as previously stated, by our practice of keeping patients, with the exception of some in the advanced group, until they are ready to resume work. Comparing the status of discharged cases I find the figures of Trudeau Sanatorium show that 31% leave the institution as active. King George V Sanatorium in England gives the same percentage.

Dr. Knight and Dr. Dublin find, as we would expect, an increased mortality in the female sex.

The morbidity experience is rather difficult to compare due to lack of comparable studies by other sanatoria. A study made by the Edison Illuminating Co. of Boston, over a period of ten years, showed that there was an average absence in males of 8.9 days, which compares with our experience of 8.6. The females showed an average of 14 days' absence, as compared with a 13 day absence in our office group. However, they included absences of one day and absences due to accident. The U. S. Public Health Service has likewise made a study of the absence records and they found the annual average in both sexes to be 8.15 days. In our percentage of absences there is a rather wide variation between the male and female—67% in the former and 25% in the latter. This I think is explained by the higher percentage of incipient cases in the female sex.

In comparing the ability of patients to work it is difficult to find studies with equal periods of time for discharged cases. Trudeau Sanatorium over a 23 year period, which is much longer than ours, finds 41½ of their cases at work. Barsdell for a 5 year span found 42.5% doing full time duty; Cox over the same number of years 63.8%. Cohen at the end of 11 years found 65.7% economically independent. Ferguson in Saskatchewan for a 7 year period reports 44% able to work. Brooks states that 41% of his incipients were at work, 36% of his moderately advanced cases, and 16% of the far advanced. Thirty-five per cent of all cases were dead at the end of four years.

The results of any sanatorium, I think, are directly proportional to its ability to acquire the early cases and

afford a sufficiently long period of curing for the cases received.

With regard to Dr. Battle's paper, the literature will support any view one wishes to maintain. It makes a very great difference whether one studies the mortality or the incidence. The former is perhaps more accurate, but it does not take into account those who have become infected and subsequently get well.

Another thing that must be taken into consideration is the social stratum. Dr. Battle's figures deal, I expect, with a general cross section of the population, and his cases include both the accepted and rejected applications, which does not make it a selective group in any sense.

One of the outstanding facts generally conceded by all, I think, is that the decline in the tuberculosis death rate has been too rapid to be explained entirely by the epidemiological characteristics of the disease, as has been advocated by some. In addition, it is a well known fact that the countries which have been most energetic in anti-tuberculosis measures have shown the greatest decrease in mortality rates. If these two conditions can be granted, the measures that have produced these changes have been largely the removal of infection and the elimination of poor hygienic and social conditions. An example of the results of poor hygiene is afforded in the report of the Hälso Institute from 1906 to 1914. A total population of 2,293 was carefully studied and 90% of these people were examined. The population is very stable with very little migration, but the hygienic conditions in 1906 were very poor. Most of the families lived in one room, their food was of a poor variety, and their sleeping accommodations most deplorable. The beds were actually

enclosed cupboards with shutters on the sides affording the only ventilation possible. One can readily appreciate the possible chances of infection by a coughing tuberculous individual in such a contrivance where many of the children slept in one bed. At the beginning of this study 12% of the population had pulmonary tuberculosis and 14% had tuberculosis when all forms were included. A total 371 households was examined and one-third stated that one or both parents had died of tuberculosis, while one-fourth who did not have a tuberculous parent gave a history of tuberculosis in one or more brothers or sisters. One-half of the group knew of deaths from tuberculosis in their immediate relatives. In 1926, as a result of hygienic corrections, the mortality had decreased 28% and the morbidity 33%.

The second example of bad environment is given by the Odessa Tuberculosis Institute, which made a study from 1912 to 1927, during a period when living conditions were in a most regrettable state. In determining the incidence of tuberculosis in families they adopted the exacting standard that there must be at least two bacillary cases in each family. In all 139 families were carefully examined. Fifty-five per cent of the parents had open tuberculosis and 33% of the children in these families had positive sputa. They divided the cases in three groups—both parents with a positive sputum, one parent and one child with positive sputum, and, thirdly, two children expectorating tubercle bacilli.

In 34 families with both parents tuberculous 7.5% of the children had died with this disease, and 15% of the children were suffering from open tuberculosis. In Group II (one parent and one child tuberculous) 6% of the children had died and 32% were found to be

tuberculous. In the third group of 37 families having two children suffering from open tuberculosis, none were dead but 44% had tubercle bacilli in the sputum.

In comparison with the figures given above Rathbun in this country states that 8% of the contacts in tuberculous families show definite parenchymal changes by X-ray. Opie finds latent or manifest tuberculous lesions in 8.9% of the children with parents having bacilli in their sputum. The very careful work of Opie and McPhedran shows that in cases of prolonged contact where one consort is tuberculous both husband and wife were infected in 47% of instances, whereas in the non-tuberculous families latent apical lesions by X-ray are demonstrable in only 7%. Roussell, in France, found the husband and wife tuberculous in 11.6% of 423 families, and 37.5% of their children tuberculous. Harms and Seitz, of Germany, state that if 129 infants and small children exposed from birth to 7 years of age, 12.4% had died, 8% of these in the nursing period.

The average mortality rate seems to vary between 3 and 5%, which compares very favorably with Dr. Battle's figures. The mass of statistics indicates very clearly that more uniform methods of inquiry should be adopted. One would like to know (1) Did tuberculosis exist before marriage? (2) At what date after marriage did the consort become tuberculous? (3) How long a time after discovery of the disease did the contact exist? (4) The whole life history of the surviving partner.

In the matter of obtaining statistics one observer has been so unkind as to state that in obtaining a family history it makes a very great difference whether the information was obtained from the female or male member of the family. The female, who takes a greater

interest in family history, gave on an average of 10% higher incidence than the male.

To my mind there are three factors concerned with the question of infection: (1) dosage; (2) duration of the doses; (3) age at which it is administered.

Dr. Battle has suggested the possibility of heredity being a factor. I would call your attention to the scholarly investigation made by Pearl, who in minutely examining 57 families and their offspring, found virtually three-fourth of the non-tuberculous children had been in just as close contact with the actively open cases as had their unfortunate brothers and sisters who developed the disease. Drolet has also given heredity a very hard blow by stating that 59% of the tuberculous children with a non-tuberculous parental history had tuberculosis, whereas only 34% with definite tuberculosis gave a positive parental history. I think that we must admit that adult infection does occur. The work of Opie and McPhedran definitely proves this conclusion.

I thank you. (Applause.)

Dr. Daley—Does any member present desire to discuss either of these papers?

Dr. Rollins—I don't suppose I have any place to express an opinion without having any backing of statistics. It was my privilege to work for about three and a half years in China, and at that time I made one observation which will always remain with me, and that is if there is anything in the theory of an immunity being conferred in tubercular cases, it is not carried out in China. There is no older country than that and there is not a country on the face of the globe where tuberculosis is more prevalent and where there are

more deaths from a single cause than one can find there.

Of course, one has to realize that we are dealing with all of the different strata from the poorest right up to the wealthiest. I was able to go into the families where they lived on only a few cents a day up to where thousands of dollars meant nothing, and the same observation held true, that tuberculosis without any question was the first disease. It was the one that caused the greatest number of deaths, both in the poor and in the rich leaving out the acute infections. There is one other man in this audience that I know can confirm that observation, not only in China but in some of the other eastern countries.

To my mind the three points that the doctor of the Metropolitan brought out are the ones that are of the greatest significance, the age, the dosage and the period of exposure.

I thank you. (Applause.)

Dr. Daley—If there is nothing further the meeting will adjourn. Luncheon is at one o'clock.

(Friday Afternoon Session.)

Dr. Daley—Dr. Fellows, I wonder if you could tell us a little bit more about what your Company is doing for its employees.

Dr. Fellows—Dr. Daley and Gentlemen: I know perfectly well that I made a mistake in coming here this afternoon, because I had no desire whatever of making a speech.

The point upon which Dr. Daley has asked for a little further elucidation is, how we detect tuberculosis at the Metropolitan, either among applicants for em-

ployment or among the employees. The background is perhaps as important as how we work. In the past we have put all applicants for employment through a rather rigid physical examination and taken a careful history, not on the basis of employment alone, but because after six months' service, employees become eligible for group life and disability insurance. Our experience has been that in the past few years, in spite of this history and physical examination, a small group of employees within the first year of employment, and a larger group within the second year of employment, break down with advanced tuberculosis which in all probability they had when they came to us. That, then, is the reason why we began to pay more attention to the detection of tuberculosis.

There are two ways, besides the usual method of physical examination, by which most tuberculosis can be detected. We will not consider the borderline case; we will take the definite case of tuberculosis. One is by the examination of the lungs by X-ray. This method has some disadvantages. Among these are initial cost of equipment, the necessity of employing high salaried personnel, the relatively large amount of floor space needed, and the substantial expense for films and other materials.

The other method of detecting tuberculosis entails the use of the fluoroscope. We knew the fluoroscopic examination of the chest was old, of course, but much to my amazement in France it has been one of the accepted methods for thirty years. For various reasons the fluoroscope has been disparaged in this country for years. In most of the books on chest examination and X-ray diagnosis the fluoroscope is mentioned only to state that it is useful in examining the

heart, aorta, and esophagus, and is useless in the detection of tuberculosis. On questioning several persons who have made these statements as to how many cases they have examined with the fluoroscope, the usual answer is, "We don't examine that way; the literature says the fluoroscope is useless." We didn't believe that that was so, in fact, experience led us to believe the opposite to be true, so we started out just about a year ago to make routine fluoroscopic examinations of the chest. The applicants were taken after they had had the usual physical examination, and were examined by a trained observer. Immediately we began picking up with the fluoroscope persons with tuberculosis who under our old system would have been accepted for employment. All cases which were considered pathological or questionable by fluoroscope were X-rayed so that the evidence one way or the other would be a matter of record.

Very briefly, about 4,000 applicants for employment have been examined in the past year and we have found about 1½% of anatomical tuberculosis of all stages, varying from incipient to far advanced, most of which did not give physical signs. We have felt that when tuberculosis is detected in persons applying for a position, it isn't fair to say, "You can't work for us." That is not disposing of that case properly. Some of these applicants had active tuberculosis at the time of applying for work and by putting them in contact with a suitable tuberculosis clinic, they have been admitted immediately to sanatoria, or have been placed on a waiting list for admission and given medical care while awaiting admission. This method has taken care of the acute cases. We have done something a little unique in being able to follow up and get subsequent examinations on these

people, whom we have rejected for employment and who, one would certainly expect, would never want to see us again. As a result of a kindly initial personal contact and subsequent personal letters, about 60% of the rejected cases have come back for further examination. In a few of these the disease has progressed and at the time of re-examination they have been convinced that they are sick and have placed themselves under treatment. A relatively small number we have accepted for employment where they have had a juvenile type of tuberculosis which, according to our present understanding, is safe. That's about as far as we have gone.

We are probably missing some tuberculosis, but we have detected within the last year 60 cases of definite disease who previously would have been accepted for employment. Some of these were active at the time as proved by more intensive study and subsequent history, and would have been sent to the sanatorium for treatment. Thus, the Metropolitan Life Insurance Company has saved a large sum of money with very little expense.

We are now making a fluoroscopic examination on all of our employees at the time of the annual physical examination, trying to find out how much tuberculosis we really have in the Home Office. We think we have the answer in a quick, inexpensive, accurate (probably to within 10%) method of examination which will detect tuberculosis.

Now, to answer in advance a question that may be in the minds of many of you. You may say we have a highly trained technical staff and have the equipment. We will grant the equipment, but the staff is self-trained largely. In the beginning two doctors, one of whom was a trained fluoroscopist with-

out special training in tuberculosis and the other was specially trained in tuberculosis work, but relatively untrained in the use of the fluoroscope, made all the examinations. This work was carried on for a few months independent of the staff making the usual physical examinations. The doctors making the fluoroscopic examinations had the records of the physical examinations, but this was not of special benefit. Within six months the results were so apparent that two additional fluoroscopes were purchased and placed at the disposal of the staff at large. They were told to go to it and to learn to use the fluoroscope as they did the microscope or any other instrument. If this method of examination isn't practicable, then it's not the answer. In the last six months, a staff hitherto untrained in the use of the fluoroscope, detected a good deal of tuberculosis by just looking at each pair of lungs that were examined. We are using the fluoroscope routinely and are detecting cardiac hypertrophy and substernal thyroids occasionally, but our chief interest is in tuberculosis.

This speech was not prepared. I haven't tried to give exact figures because this is a very sketchy, brief summary of the year's work. If there are any questions, I will be glad to answer them. (Applause.)

Dr. Daley—Dr. Fellows may feel that his little talk was sketchy and brief, but to us it seemed quite complete. Is there anybody else who would like to talk on this subject? If not, we will proceed to the paper which we have held over from this morning.

We inherited, so to speak, the non-medical examination from our Canadian friends across the border. In the Equitable, we so far are glad of this inheritance.

I have asked Dr. Scadding to give us the benefit of his experience on this subject, and you already have his article before you in the fasciculus.

A MORTALITY INVESTIGATION OF MALE LIVES ACCEPTED WITHOUT MEDICAL EXAMINATION

(Presented with the kind permission of the Actuaries' Club.)

H. CRAWFORD SCADDING, M. D.

*Medical Director, Canada Life Assurance Company*

MATERIAL INVESTIGATED AND TREATMENT OF DATA

(a) Non-medical Business in Canada of 4 Canadian Companies issued in the calendar years 1921 to 1927 inclusive, observed over the calendar years 1924 to 1927 inclusive. The contributing companies:

Canada	Manufacturers
Confederation	Mutual

(b) Extent of Data:

Exposures	Deaths
\$335,879,807	\$839,662

The exposures are not quite double and the deaths slightly over double those of the 9 companies experience over 1924 and 1925.

(c) The investigation was by Amounts.

(d) The basis of comparison was the C<sup>m</sup> select table of mortality.

(e) The calculation of expected deaths by this standard followed the procedure laid down in the earlier report.

#### OBSERVATIONS ON RESULTS

(a) The experience has fluctuated within fairly narrow limits over the four years, going from 73.4% in 1924 to a minimum of 62.8% in 1925 and then increasing to 67.4% in 1926 and 73.4% in 1927. The 9 companies' experience gave a ratio of 71.9% in 1924 and 65.6% in 1925. The total experience to date gives a ratio of practically 70% of C<sup>m</sup> mortality.

(b) The selections of 1925, 1926 and 1927 have not so far fared as well as those of the years 1923 and 1924 either due to accidental fluctuation or to a slackening of the stringency of the selection on the companies' part.

(c) The experience continues to show, though to a less marked extent, a low mortality in the calendar year of issue of 60% as against slightly over 70% for longer durations.

(d) One noticeable feature of this later 4 companies' experience is the lower mortality in the older age groups. In fact if the small group aged 45 and older at issue is combined with the groups 40-44, the ratios appear fairly constant throughout but lower from 25 to 34.

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## NON-MEDICAL MORTALITY INVESTIGATION—MALE LIVES

### Summary All Ages Combined

Year of Issue	Cm Select Expected Claims	Actual Claims	%
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#### 1924 EXPERIENCE

	Amount in Force 31/12/24			
1921	\$ 3,866,484	\$ 17,490	\$ 19,000	108.6
1922	9,004,205	37,873	25,980	68.6
1923	17,365,748	64,577	46,111	71.4
1924	25,900,197	31,483	20,000	63.5
Total	\$56,136,634	\$151,423	\$111,091	73.4

#### 1925 EXPERIENCE

	Amount in Force 31/12/25			
1921	\$ 3,583,720	\$ 17,558	\$ 7,000	39.9
1922	8,549,903	37,983	33,810	89.0
1923	15,586,181	65,186	47,598	73.0
1924	20,082,654	75,784	45,000	59.4
1925	32,125,154	39,160	14,500	37.0
Total	\$79,927,612	\$235,671	\$147,908	62.8

#### 1926 EXPERIENCE

	Amount in Force 31/12/26			
1921	\$ 3,374,205	\$ 17,130	\$ 14,682	85.7
1922	8,033,309	38,641	31,486	81.5
1923	14,732,675	65,462	23,457	35.7
1924	18,725,209	76,899	60,973	79.3
1925	25,967,030	96,551	67,032	69.4
1926	40,445,874	49,770	34,488	69.3
Total	\$111,278,302	\$344,453	\$232,118	67.4

#### 1927 EXPERIENCE

	Amount in Force 31/12/27			
1921	\$ 3,331,330	\$ 17,206	\$ 8,895	51.7
1922	7,922,939	39,525	25,441	64.4
1923	14,212,397	67,287	51,980	77.3
1924	17,832,506	79,032	40,483	51.2
1925	23,491,867	98,275	84,959	86.5
1926	33,261,833	122,925	103,817	84.5
1927	41,089,667	50,724	32,970	65.0
Total	\$141,142,539	\$474,974	\$348,545	73.4

## Thirty-Ninth Annual Meeting

## NON-MEDICAL MORTALITY INVESTIGATION—MALE LIVES

## Summary by Calendar Year of Issue

Year of Issue	Amount in Force at End of Year	Cm Select Expected Claims	Actual Claims	%
1921	\$14,155,739	\$ 69,384	\$ 49,577	71.5
1922	33,510,356	154,022	116,717	75.8
1923	61,897,001	262,512	169,146	64.4
1924	82,540,566	263,198	166,456	63.2
1925	81,584,051	233,986	166,491	71.2
1926	73,707,707	172,695	138,305	80.1
1927	41,089,667	50,724	32,970	65.0
Total	\$388,485,087	\$1,206,521	\$839,662	69.6

## NON-MEDICAL MORTALITY INVESTIGATION—MALE LIVES

## Summary by Durations

	Amt. in Force at end of Specified Calendar Year	Cm Select Expected Claims	Actual Claims	%
Calendar Year of Entry	\$139,560,892	\$ 171,137	\$101,958	59.6
1st Calendar Year after Entry	96,677,265	359,837	261,960	72.8
2nd Calendar Year after Entry	66,807,462	278,238	219,510	78.9
3rd Calendar Year after Entry	44,981,568	199,967	116,750	58.4
4th Calendar Year after Entry	25,829,426	123,486	90,466	73.3
5th and Succeeding Calendar Years after Entry	14,628,474	73,861	49,018	66.4
Totals	\$388,485,087	\$1,206,521	\$839,662	69.6

## Scadding—Non-Medical Mortality 285

### NON-MEDICAL MORTALITY INVESTIGATION—MALE LIVES

#### Rate of Non-Renewal

Age Groups	Calendar Year After Entry					6
	1	2	3	4	5	
1924						
15-24	22.2%	10.5%	6.9%			
25-34	18.4	11.5	2.6			
35-up	16.0	9.4	5.3			
Total	19.5	10.6	4.6			
1925						
15-24	25.0%	10.5%	5.9%	6.1%		
25-34	22.1	10.1	4.8	9.0		
35-up	17.5	9.0	2.6	6.0		
Total	22.3	10.0	4.7	7.3		
1926						
15-24	23.7%	6.8%	6.1%	6.0%	6.2%	
25-34	18.9	6.8	5.1	6.5	5.3	
35-up	12.2	5.5	4.2	4.4	4.7	
Total	19.3	6.5	5.3	5.8	5.4	
1927						
15-24	22.2%	9.8%	5.8%	3.3%	1.2%	2.7%
25-34	17.6	9.4	4.1	5.1	1.1	0.2
35-up	11.5	8.0	3.1	2.5	0.8	0.3
Total	18.0	9.2	4.6	3.7	1.1	1.0

The lapse experience of the four companies is slightly more favorable than that of the nine companies but exhibits the same peculiarities of very heavy lapse rates in the calendar year after entry, decreasing with increasing age and duration. Lapses in the first calendar year after entry reached a maximum in 1925, and have been decreasing since. The limitations of these rates are indicated in the earlier report.

### NON-MEDICAL MORTALITY INVESTIGATION—MALE LIVES

#### Summary According to Age Groups All Durations

Age Group	Amount in Force at End of Year	Cm Select Expected Claims	Actual Claims	%
15-19	\$ 66,395,984	\$ 171,345	\$ 116,496	68.0
20-24	89,549,306	261,800	195,522	74.7
25-29	72,279,777	210,782	138,094	65.5
30-34	62,196,172	184,333	113,603	61.6
35-39	52,010,090	174,900	127,478	72.9
40-44	39,066,350	166,657	130,539	78.3
45-	6,987,408	36,706	17,930	48.8
Total	\$388,485,087	\$1,206,523	\$839,662	69.6

Dr. Daley—I will ask Dr. Seadding to close the discussion later, and now if Dr. Rockwell will come up and tell us something about this vast subject, we will appreciate it.

Dr. Rockwell—While the Equitable writes insurance on the Non-medical plan, the applicant must be an Equitable policyholder, and his previous insurance standard. Acceptable ages are from 15 to 55, inclusive.

Recently, on account of our apparently favorable experience, we extended the non-medical limits, so that at the present time we may issue

- (a) \$20,000 if applied for within one year of the time of the regular medical examination;
- (b) \$10,000 between the first and second years;
- (c) \$5,000 between the second and fifth years;
- (d) \$2,500 between the fifth and tenth years.

(\$5,000 only may carry Disability and Double Indemnity features.)

From February 15, 1926, the day we began to write Non-medical insurance, to August 15, 1928 (two and one-half years), we acted on 36,946 applications, amounting to \$92,824,000. Our declination ratio for medical reasons only was approximately 5%. This is about the same ratio as that obtained on regularly examined business.

Our death losses during this period amounted to \$202,761. The expected death losses on the basis of the Society's experience on corresponding standard lives, \$242,659. This gives us a mortality ratio of 84%, compared to a mortality of 100% for standard examined business.

In addition to the favorable mortality, we have also

saved in medical fees approximately \$137,000. We find the "Not Taken Out" ratio considerably less than for regularly examined business.

Of the 82 policies terminated by death, 21 were the result of accident or violence; 16 of pneumonia; 5 heart disease; 4 cancer; 4 influenza; 4 tuberculosis.

On the whole, we are satisfied with the results so far obtained.

Dr. Daley—Dr. Baker will you continue the discussion?

Dr. Baker—In continuing the discussion of Dr. Scadding's very valuable paper on Life Insurance Without Medical Examination, I wish to say that we feel indebted to him and to his associates among the Canadian companies for first establishing the Non-medical business in this country. By that I mean introducing it on the North American continent, for after all is said and done we know that Canada and the United States are all one country, despite some slight political differences.

Our own company was influenced very largely in going into Non-medical business by the favorable experience of the Canadian companies. We felt that, in our own territory at least, conditions would be somewhat similar and that we might hope for the same good results.

We started in with Non-medical in May, 1925, with practically the same rules as observed by nearly all of the Canadian companies, as follows:

Ages 15 to 45 inclusive; amounts \$2,500 and less on all forms, including term; policies written with waiver of premium and double indemnity but not with the annuity disability feature; married women not accepted on Non-medical; the Company reserving the right to order medical examination in any case.

Desiring to try out the plan under the most liberal conditions possible, we made no restrictions as to the agents who were permitted to write Non-medical but gave it to our entire field force without distinction. We also carried the plan into all states where permitted by law. At first there were a number of states where life insurance could not be written without medical examination but the number has decreased until at present it includes only the states of Arizona and Iowa. Although the plan was originally designed with especial reference to the rural districts where medical examinations were difficult to obtain, we extended the plan to city and country alike and a large proportion of our Non-medical business has been written on the industrial population in the cities.

Up to October 1, 1928, we have received a total of 58,957 applications for an amount of about \$85,000,000. The disposition of this business has been as follows:

Issued	54,004	percentage	91.8
Declined	920	"	1.58
Withdrawn	1,187	"	2.
Ordered examined	2,741	"	4.6

Of the number ordered examined, about 50% were eventually issued as the result of medical examination. The total amount issued has been \$77,933,077 and we have had 142 death claims for the amount of \$226,000. On the 58,957 cases submitted to the Company, and making an allowance for extra policies, etc., which would not have required medical examination, we have made a saving in medical fees of approximately \$290,000. We have, therefore, saved an amount on medical fees more than sufficient to pay the entire

mortality for the period during which we have been engaged in this business. Before taking up in detail the percentage of claims to the expected mortality, I will discuss some of the practical features in relation to the business.

There were several questions that arose in the beginning that caused no little concern to the Company. Among these were, first, the effect of the Non-medical plan on the agents. Second, on the medical examiners. Third, on the applicants seeking insurance, and fourth, on the Company itself. All of these questions have now, we believe been solved satisfactorily. The effect on the agents has been surprisingly good. It has, indeed, been a great help to those agents operating in the rural districts and it is scarcely less appreciated by those soliciting among the industrial classes in the cities.

We feel that our business has been increased by the writing of Non-medical and certainly the sales resistance has been lessened. It is easier to insure people on the Non-medical plan than it is on the medical plan. In some cases where applicants have expressed a desire to be examined, we have always accorded them this privilege but it has been requested in a very small number of cases.

The effect on the medical examiners of the Company has not been unfavorable for the very reason that they have not been aware of the extent of this business and certainly the agents have not made it a point to go around and tell them about it. We have had a few letters of objection but these were handled in a diplomatic manner by the Medical Department and no serious disagreements have been noted. The average field examiner receives such a

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small number of examinations from each individual company that the effect of Non-medical is not strongly apparent. We believe that in a few years nearly all medical examiners will accept the fact of Non-medical life insurance—without objection.

Third, the effect on the Company. We are entirely satisfied with our Non-medical experience up to the present time. The mortality has not been greatly different from the mortality on our best class of medically examined business. In fact, for a time it was lower but the business with which we compared it was that including the larger policies and the older ages. What the Company really did was to select out the very best section of our entire business, namely, that on male lives up to age 45 and amounts up to \$2,500 and place this on a Non-medical basis. If this same business had been medically examined, we should undoubtedly have obtained a still lower mortality thereon. This very factor has increased the general mortality of our company several points. However, the increased business given us under Non-medical has more than offset the slightly increased mortality of the Company. The most unfavorable feature connected with the Non-medical is the excessive lapse ratio. Our experience to date has shown a lapse ratio on the Non-medical which is at least fifteen per cent higher than that on the medically examined business. This is a factor that must be reckoned with in writing Non-medical business. I believe that in this connection there applies the ancient saying that "What is easily gained is little valued." However, in spite of the high lapse ratio, the favorable factors, in Non-medical life insurance far outweigh the unfavorable ones so far as we can tell at the present time.

We will now turn to the comparative mortality experience of the Canadian companies and our own company, and from this you will see that our experience has not been quite as favorable as that of the Canadian companies. As the basis of comparison we have used the American Men's Select Table and over a period of  $3\frac{1}{2}$  years we have had an experience of 78.33% of that table, whereas the Canadian companies over the same period show an experience of 73.8% of the Canadian Men's Select Table. This gives the Canadian companies a mortality five points better than our own for this period but I believe this may be accounted for through the difference in the character of the business, the Canadian business being a rural business to a larger extent than our own. However, the close agreement in the figures is additional proof that selection on this new and untried basis is being rapidly standardized.

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## KANSAS CITY LIFE INSURANCE COMPANY

Mortality Experience—Non-Medical Business From May 1, 1925, to August 31, 1928—Ages 15 to 45, inc. Basis American Mens Select Table.

## 1925 EXPERIENCE

Year of Issue	Amount in Force end of Year	Expected Claims	Actual Claims	%
1925	3,308,277	3,441	2,000	58.12
Total	3,308,277	3,441	2,000	58.12

## 1926 EXPERIENCE

1925	2,591,777	10,834	8,000	73.84
1926	19,649,691	30,654	25,500	83.19
Total	22,241,468	41,488	33,500	80.75

## 1927 EXPERIENCE

1925	1,543,277	6,837	5,000	73.13
1926	14,707,493	61,477	44,000	71.57
1927	27,175,360	42,394	47,500	112.04
Total	43,426,130	110,708	96,500	87.17

## 1928 EXPERIENCE FIRST EIGHT MONTHS

1925	1,432,277	4,426	2,000	45.19
1926	10,210,259	30,120	24,000	79.69
1927	22,441,744	62,612	45,500	72.67
1928 to 9/1	19,639,626	20,425	10,500	51.41
Total	53,723,906	117,583	82,000	69.74
Grand Total	122,699,781	273,220	214,000	78.33

## SUMMARY BY CALENDAR YEAR OF ISSUE

1925	8,875,608	25,538	17,000	66.57
1926	44,567,443	122,251	93,500	76.48
1927	49,617,104	105,006	93,000	88.57
1928 to 9/1	19,639,626	20,425	10,500	51.41

Total 122,699,781 273,220 214,000 78.33

## Jaquith—Non-Medical Mortality 293

Dr. Daley—Dr. Walter Jaquith.

Dr. Jaquith—The Company with which I am connected commenced writing insurance without medical examination July 1st, 1925—the low age limit being fifteen and the maximum forty-five years. On male lives the limit fixed was \$2,000.00 and on unmarried female lives \$1,000.00; on all plans of insurance excepting Term and Modified Life. On May 1st, 1927, the maximum limit on male lives was increased to \$2,500.00.

During the three year period, July 1st, 1925, to June 30th, 1928, applications were submitted as follows:

	No. of Apps.	Amount
July 1, 1925, to June 30, 1926	2,575	\$ 3,375,571
July 1, 1926, to June 30, 1927	3,466	4,632,417
July 1, 1927, to June 30, 1928	7,700	10,965,937
	13,741	\$18,973,925

Average amount per application—\$1,380+

Claims were paid as follows:

	Number	Amount
Deaths occurring in 1st policy year	12	\$20,000.00
" " " 2nd " "	5	9,000.00
" " " 3rd " "	2	2,000.00
	19	\$31,000.00

Of the claims occurring during the first policy year two were on business written during the first year of the three year period, four during the second year, and six during the third year.

## DURATION OF POLICY LESS THAN ONE YEAR

Amount	Date of Issue	Date of Death	Duration of Policy	Cause of Death
\$1,000	12- 7-25	9- 3-26	8 mos. 27 days	Appendicitis with perforation into peritoneum.
1,000	2- 5-26	10-24-26	8 " 19 "	Automobile accident.
2,000	9-27-26	7-12-27	9 " 15 "	Pulmonary tuberculosis (duration of illness four months).
2,000	3-28-27	7-21-27	3 " 24 "	Struck by lightning.
2,500	8-26-27	10- 9-27	1 " 14 "	Automobile accident.
2,000	4- 7-27	10-21-27	6 " 14 "	Typhoid fever (intestinal hemorrhage).
2,000	7-13-27	12-14-27	5 " 1 "	Operation for toxic goitre.
1,500	8-29-27	1-26-28	4 " 28 "	Suicide (gun shot wound).
2,500	12-17-27	1-27-28	1 " 10 "	Automobile accident.
1,000	7-20-27	4-24-28	9 " 4 "	Septic myocarditis following operation for acute gangrenous appendicitis.
1,000	4-16-28	5-11-28	0 " 25 "	Influenza—pneumonia.
1,500	9-15-27	5-24-28	8 " 9 "	Pulmonary tuberculosis (duration of illness four months). Two sisters died of tuberculosis.

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\$20,000

## Jaquith—Non-Medical Mortality 295

### DURATION OF POLICY MORE THAN ONE YEAR AND LESS THAN TWO YEARS

Amount	Date of Issue	Date of Death	Duration of Policy			Cause of Death
\$2,000	7-29-26	8-18-27	1 yr.	0 mos.	20 days	Septicaemia (focal infection of the teeth).
1,000	5- 3-26	12-17-27	1 "	7 "	14 "	Heart disease—"dropped dead"—(attending physician stated he found a mitral regurgitant heart murmur on examination several years ago).
2,000	11-24-26	2-17-28	1 "	2 "	24 "	Mitral regurgitation with passive congestion of liver—remote cause acute rheumatic fever—(duration of illness four months).
2,000	11- 3-26	5-31-28	1 "	6 "	28 "	Suicide) gun shot wound).
2,000	4-26-27	6-13-28	1 "	1 "	18 "	Aeroplant accident.
<hr/>						
\$9,000						

### DURATION OF POLICY MORE THAN TWO AND LESS THAN THREE YEARS

Amount	Date of Issue	Date of Death	Duration of Policy			Cause of Death
\$1,000	11-11-25	3- 1-28	2 yrs.	3 mos.	19 days	Encephalitis (duration of illness one week).
1,000	11-22-25	4-19-28	2 "	4 "	28 "	Homicide—skull fracture—(hit on head with a lead pipe).
<hr/>						
\$2,000						

Of the twelve claims occurring in the first policy year, death was due to violence in five and to disease in seven. Of the seven claims in which death was due to disease a medical examination might have prevented assumption of the risks in two cases—that where death resulted from operation for toxic goitre, as in addition to a protracted history of toxic goitre the claim papers revealed a history of treatment for suspected gastric ulcer prior to the date of the application, and in the last recorded case where death was due to pulmonary tuberculosis. In the claim due to tuberculosis even on examination a substandard policy might have been issued.

Of the five claims occurring in the second policy year two were due to violence and three to disease. In the claim in which death was due to heart disease and in which the attending physician stated that several years before he had detected a mitral regurgitant heart murmur, a medical examination would have led to rejection or at best issue of a substandard policy.

Of the two claims occurring in the third policy year one was due to violence and the other to acute disease.

Dr. Patton—The Prudential has been developing a large amount of material on non-medical but not over a long enough period as yet to warrant our giving any statistical statement.

Many years ago, we started on the Industrial, and of the large mass of Industrial insurance being issued by the Prudential today, about 5 per cent was examined last year.

Then we went to the \$500 Intermediate policy, which, fortunately for us, carried a rate that covers about 150 per cent mortality on the M. A. basis for Ordinary insurance.

Later we started on a limited amount of Ordinary insurance on the Endowment form. Three years ago, we decided to go further than that, beginning with 1925 or 1926 and for the last three years we have been taking about 140,000 risks a year, limited to \$2,000 in amount, with an average policy of about \$1,200, which brings us about \$175,000,000 of that business a year.

We have not made a study of the mortality as yet, causes or amount. One of the reasons urged in favor of Non-medical was it would save us medical fees. Our actuarial friends tell us that the medical fee velvet is being used up in claims. In other words, our claims on the Non-medical are running higher than on the Medical. We have not made any analysis but I simply want to state that we are collecting a mass of material that in a few years more will begin to give us information which we can report to this Association, at least some of our own experience in that direction.

We have been taking also for a few years what we call business insurance, along the line Dr. Rockwell mentioned, on those who hold previously examined Ordinary insurance with us, but we only take within a year of that examination and up to \$10,000 on that life, provided the insurance issued was up to \$10,000, so that that amount is only running \$3,000,000 or \$4,000,000 a year, but that will also give us a certain amount of material.

However, I only want to emphasize this point: The mortality is running higher than on medical examined business. (Applause.)

There is one other feature I would like to mention. We are giving disability on that Non-medical. I hope

we are not making a mistake in adding that privilege.

Dr. Cragin—We must not lose sight of the fact when we talk about Non-medical business that there is a very strong medical selection in all Non-medical insurance. At our office all Non-medical work is based on the findings of the doctors and we call for examinations in the following:

1. If the applicant is under or overweight.
2. If there is a history of rheumatism or other infectious disease, such as repeated influenza, tonsillitis, scarlet fever, diphtheria.
3. If there is a family or personal history of tuberculosis.
4. If the M. I. B. record is not satisfactory or has not been sufficiently cleared.
5. If there is a history of recent illness or history of surgical operation.

This distinctly takes the underwriting out of the Non-medical class. When our Actuaries tell us that there is no medical selection in Non-medical insurance, we are very apt to contest the point with them.

The first few years of Non-medical selection were quite satisfactory but the mortality is now beginning to mount and there is some question in our minds whether or not eventually the mortality will be higher than that of medical selection.

Dr. Daley—Judging from the number of deaths by violence reported in Dr. Rockwell's and Dr. Jaquith's papers, these people who take Non-medical business seem to have a hunch. Now if there is any doctor here—and we all have examined a great many insurance risks—who can show us how we can find a hunch on physical examination, I sincerely trust he will get right up and tell us.

## Scadding—Non-Medical Mortality 299

This paper is open for general discussion. I hope we will hear from one or two of the members at least.

Is Dr. Grosvenor here? Dr. Grosvenor, the position which the Travelers occupies in the Non-medical business compels me to ask you to speak whether you would like to do so or not.

Dr. Grosvenor—It isn't ready, Mr. President, but I want to coincide with what Dr. Patton says, that the select mortality is very decidedly in excess of the regularly examined business and it leads me back to Dr. Seadding, the prophet in this line. I think he is also the seer, because when he was called three or four years ago, he drew attention to the different comparative business standards of the English people, Canadian people and the American people, and I think that he didn't give us any benefit of the doubt and our Non-medical experience justifies him fully. (Laughter.)

Dr. Daley—Dr. Cragin brought out the fact that there was considerable medical selection in this Non-medical business. In the Equitable, our numerical system nearly automatically indicates whether a case can be accepted on the Non-medical plan or whether it is one which we might accept if examined or one which we could not consider at all.

Is there anybody else that would like to discuss this? Dr. Scadding, now is your chance to return the compliment.

Dr. Scadding—Mr. President and Gentlemen: The President asked me to make a contribution to this subject. All I have been able to do is to submit, through the kindness of the Actuaries Club of Canada, the result of the investigation. It has been carefully prepared, I have no doubt.

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I think there is little to be said in addition to what has been said by those who have been kind enough to discuss the subject. In 1911, when we first thought of it, I was distinctly of the opinion that it could not be profitably undertaken. In 1920 I was fully convinced, by the experience of the British companies, that it could be safely underwritten provided it was based on certain conditions, namely, thrift underlying the contract, common honesty of the community, painstaking selection by reliable agents, inspections to be very carefully made, and the amounts kept small.

We started with \$1,000 as the limit of policy amount, but we were very rapidly, by competition or other reason, forced up to the larger amount of \$5,000, but at that we have stopped. While there are some companies in Canada that allow the Total Disability on the full amount of \$5,000, in my own company we have limited this feature to \$2,500.

The Equitable's experience is perhaps not entirely or purely a Non-medical one. Our own skirts, indeed, are not entirely clear in this respect, but I think that the British experience was so largely based upon cases that had not been previously examined for life insurance that it might properly be classed as purely Non-medical business.

The experience covers only seven or eight years and, while the mortality, as is shown in this investigation, is very favorable, we cannot yet say that it will continue to be so highly satisfactory. It will be very interesting to get the result of the large volume of material which will come from the larger companies, and that I am sure will throw very valuable light on the matter and prove an important guide to the con-

duct of this business in future. So far I think we are a little in the position of the gentleman who threw himself out of the twentieth story window and when he was passing the tenth said, "We are all right so far." (Laughter.)

What eventually will happen in this particular class of business in Canada and the United States, no one at present knows, but this experience is one that very strongly indicates the safety of the business provided it is not extended to too large amounts and provided that the other factors on which we establish it are or can be adhered to.

I am much obliged to you for the kind reception and discussion of this paper. (Applause.)

Dr. Daley—The next two papers on the program, gentlemen, have to do with disability benefits.

**TOTAL AND PERMANENT DISABILITY BENEFITS FOR WOMEN**

by

**JOHN FERGUSON, M. A., M. D.**

*Medical Referee, Excelsior Life, Toronto, Canada.*

In my study of this problem I shall make no appeal to the statistics of insurance companies. I shall approach the subject from the purely clinical standpoint, and start out as one seeking such information as might prove a guide in the matter of the granting of Total and Permanent Disability Benefits to Women. This is the method of collecting facts from which rules may be deduced, and upon which premiums may be constructed. In the following out of this method I shall give the sources of the statistics, and the male and female experiences separately. I have selected those diseases that are recognized as chronic, and that would belong to those causing Total and Permanent Disability Claims upon the insuring Companies. These diseases are divided into groups according to the parts of the body affected, or the special class to which they may belong. The first column is males and the second females.

## 1. DISEASES OF THE BLOOD

## 1. Pernicious Anaemia

Colman	323	227
Cabot	723	434
Coupland	56	55
Osler & McCrae	800	400
Edwards	60	40
J. Ferguson	13	4
Stevens	more males than females	
Strumpell	more males than females	
Gulland	males and females about equal	

These statistics could be increased by quoting the experience of others, and hospital records, but enough has been given to prove the decided predominency of the disease among males. The disease is very rare under 20, and equally rare after 60. Cases occurring between 20 and 30 are about equally divided, but between 30 and 60 males certainly take the lead.

## 2. Leukaemia

In this disease the number of males far exceed that of the females.

Tyson—most common in males of mid life

Anders—most frequent in males under mid life

Stevens—more males than females

Osler & McCrae—more common among males

C. L. Greene—males 2 to 1 female

## 3. Lymphatic Anaemia (Hodgkin's)

Tyson states that this disease is one of adult life most frequently met with among males.

Osler and McCrae claim that this disease is met with most frequently among young adult males.

Anders states in every 100 cases, 30 are under 20 years of age; 34 from 20 to 40 years; and 36 over 40 years. He also states that of every 100 cases 75 are males.

Stevens says commonly young adult males.

W. R. Gowers	75	25
Fisher	86	36
Clarke	32	11
Longeope	58	28
J. Ferguson	5	2

Strumpell states that the disease is undoubtedly more common among males than females, and that 62% of the cases occur between 15 and 60 years of age, 36% being under 15 and 2% over 60.

#### 4. Addison's Disease

Though not strictly one of the blood diseases, this one may be included here. It is a rare but fatal disease with a lengthy period of invalidity. Nearly all the cases occur between 15 and 60 years. Greenhow, in a collection of 183 cases, found 119 males, 64 females. The count here very decidedly favors the females.

#### 5. Gout

As there is some matieres morbi in the blood in gout it is also included in the group of blood diseases. It is only mentioned here because it is much more common in men than in women, and because it is such a potent factor in causing other serious and chronic diseases, such as arteriosclerosis, nephritis, heart affections, bronchitis, and joint disorders.

#### 2. DIGESTIVE ORGANS INCLUDING LIVER

In discussing this group it should be borne in mind

that all these cases do not cause total and permanent disability, the proportion of such total and permanent disability cases would bear a close relationship to the number of cases in each sex. The total cases would, therefore, indicate to which side the pendulum must swing. It is in this way that the value of the sexes may be estimated from an insurance aspect.

### 1. Oesophageal Disease

(a) Osler and McCrae give cancer as more frequent among males than females. Anders also gives males as the most frequent victims. Strümpell is even more positive with the statement that cancer of the oesophagus is decidedly more frequent in males than females. Zenker and Von Ziemssen declare that 80% appear between the ages of 40 and 60, and that at least 80% are in males. The duration is about one year. Tyson and Anders agree with the foregoing views.

(b) Stricture of the oesophagus is the result of a number of causes, such as swallowing caustic liquids, syphilis, tuberculosis, tumors, aneurisms, lymphoma, etc. These causes are such as to induce stricture more frequently in the male than the female; and *per contra* making the latter the more desirable, as applicants for disability benefits.

### 2. Diseases of the Stomach

(a) Cancer is one of those invalidating maladies that demands careful consideration because of its frequency and its chronicity. Strümpell gives the sexes as equal sufferers. In this, however, few agree with him.

A. A. Stevens—more males than females.

Walch gives—five males to four females and states

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75% of the cases occur between the ages of 40 and 70.

Osler and McCrae state that most cases occur between 40 and 60. They met with only four cases over 70 in a total of 150. The disease is more frequent in the male sex. Tyson agrees with this statement of Osler.

The data furnished by C. F. Martin are very important, as to age, from 7,000 cases:

20-30	1.5%
30-40	8.8%
40-50	18.0%
50-60	28.0%
60-70	28.0%
70-80	14.0%
over 80	1.7%

As to sex, in 20,000 cases, 58% were men and 42% were women.

With regard to age and sex Perry and Shaw give the following figures:

10-20	2	1
20-30	3	4
30-40	18	16
40-50	76	26
50-60	60	23
60-70	39	5
70-80	6	4
	204	79

The average duration is about one year, though some cases are quite acute and others linger on for years.

As cancer of the stomach is a fatal disease, the vital

statistics of Ontario are interesting and instructive. Here, however, cancer of the liver is combined with cancer of the stomach.

For Ontario the deaths are	610	501
For all Canada deaths are	1,181	870

In all these figures there is ample proof that women are the better risks for disability, so far as this particular form of cancer is concerned.

(b) Ulcer of the stomach sometimes gives rise to a disability claim, and the ratio would hold fairly even for the two sexes in the matter of total and permanent disability benefits. Anders tells us that under midlife more women than men suffer with gastric ulcer; but that after midlife more men have gastric ulcer than women, and that the disease now becomes more chronic, a fact which is adverse to the males.

The following figures are interesting and from widely separated centres:

Rokitansky	33	46
Brinton	1	2
Miguel	33	75
Welch	680	1019
Moynihan	42	96
Martin	1804	2912
Lebert	3 to 10	
W. J. Mayo	745	255

These statistics include acute and chronic cases. The acute cases are in the ratio of 1 male to 9 females, and the chronic in the ratio of 3 males to 1 female. This would seem to make it clear that in the matter of chronic gastric ulcer, the form that might give rise to permanent disability claims, the males show up much less favorably than the females.

The latest Ontario statistics give 40 deaths among married men between the ages of 15 and 64 from gastric ulcer and 17 deaths among women between 15 and 64.

### 3. Diseases of the Intestines and Peritoneum

(a) Cancer of the bowels and peritoneum is of sufficient frequency and chronicity as to demand some attention.

Tyson tells us that 5% of the cases are in the small intestines, 15% in the large intestines, especially the caecum, and 80% in the rectum.

Brown and Goither are authority for the statements that from 8 to 11% of all cancers find their location in the intestinal tract, and that the disease is found more frequently in the male sex.

From the latest Ontario report it is learned that cancer of the intestines, rectum and peritoneum caused during the year the death of 53 males and 73 females. Between the ages of 15 and 64 there were 31 male deaths and 33 females, or practically an equal number.

Alfred Stengel, quoting from Maydl, Nothnagel, Heimann, Zemann and Müller, finds that of 26,340 cases of general cancer, 2,255 or 8.56% were in some portion of the intestinal tract including the rectum. In a series of 659 cases, 6.22% were in the small intestines, 6.82% in the caecum and appendix, 22.76% in the colon and 64.18% in the rectum and sigmoid. Stengel is of the opinion that cancer of the bowels is more frequently met with in the male than the female.

It may be in order here to give a word of caution. It is safer to be guided by the report of cases than by the report of deaths as a means of determining the attack rate on any given part of the body. The cases

are usually the findings of capable clinicians in private and hospital practice, and are, therefore, much more dependable than the death reports, so often the opinion of careless or inaccurate observers. When such teachers as Stengel and Brown and Goither express the view that cancer of the bowels afflicts males more frequently than it does females, one is justified in placing a good deal of dependence upon the opinion.

(b) Tuberculosis of the peritoneum, according to Anders, is in the ratio of 2 males to 3 females, and usually between 15 and 40 years of age.

In Canada the reported deaths from intestinal tuberculosis were 46 males and 83 females. In Ontario there were 14 deaths among males and 29 among females. The chronic cases would be for each sex in this ratio.

(c) Abdominal ascites is due to some other disease, and will prevail in the male and female in proportion as the causes are found in the sexes, such as heart disease, cancer, tuberculosis, etc.

#### 4. Diseases of the Liver

(a) Cancer of the liver and gall bladder is one of the important chronic disabling diseases.

Osler and McCrae give one case of cancer in the gall bladder in the male to 3 cases in the female; whereas in the case of cancer of the liver they state that there are more men affected than women. Most of the cases occur between the ages of 40 to 70.

Tyson states that cancer of the gall bladder affects more women than men, but that cancer of the liver is most commonly met with in men.

Anders says undoubtedly more males.

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Strümpell gives cancer of the gall bladder as occurring more frequently among women than men.

Stevens states that more men than women are the victims of cancer of the liver.

The vital statistics of Ontario give for the ages of 15 to 64. Among males 255 deaths from cancer of the stomach and liver, and 210 such deaths among females.

The statistics of Canada give for the same ages and location of disease 598 male deaths and 401 females due to cancer. Knowing what we do about the frequency of cancer of the stomach in the two sexes, there is a distinct excess of the disease in the liver of males.

(b) Cirrhosis of the liver is very especially a disease of males. Anders says mostly found in males from the ages of 35 to 50.

Strümpell remarks much more often in men than in women and usually about midlife.

Stevens states that the atrophic form of biliary cirrhosis is usually found in men at midlife; and the hypertrophic is chiefly met with in men from 20 to 35.

Osler and McCrae write that this disease is most frequently found in middle aged men.

Tyson tells us that it is a disease of men rather than women, and occurs about 35 years of age and later.

Rolleston found 121 males, 44 females.

Stengel and Kern	3 to 1
Edwards	75 to 25
Stevens	4 to 1
J. Ferguson	15      3

All agree that age of onset is usually from 35 to 50. In Ontario the reported deaths from hepatic cirrhosis

for ages ranging from 15 to 64 were 24 males and 14 females.

For all Canada the deaths from this cause were given as 123 males and 66 females.

(c) Gallstones, though a very common condition, are very seldom the cause of total and permanent disability. They are only important in this regard as one of the causes of cancer of the gall bladder. Berkeley Moynihan says 1 in 10 adult males, and 1 in 4 adult females have gallstones.

### 3. DISEASES OF THE URINARY ORGANS.

#### 1. Chronic Nephritis.

The causes leading up to chronic nephritis would pave the way to what clinical experience proves to be the fact that this condition is much more common in men than in women.

Stevens says that the usual age is from 40 to 60 and males much oftener than females.

Anders finds more males than females afflicted.

Osler and McCrae regard the disease as more common among men than among women. The parenchymatus form of chronic nephritis is mostly met with in young adult males.

Edwards lays down the usual ages from 20 to 50, and males more frequently than females.

Tyson gives 2 males to 1 female and chronic parenchymatus type mostly in young adult males.

The latest statistics for Canada give during the ages from 15 to 64, the mortality among males from this disease as 538, and the deaths among women as 494.

By the Ontario statistics there were for the same

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ages 56 deaths among males and 59 deaths among females.

J. B. McElroy sums up the influence of age and sex thus: The great majority of the cases occur before the fiftieth year of age, and they are more frequent in the male sex than in the female.

2. Diabetes Mellitus

This disease is included here because an important clinical feature pertains to the urine. The following figures are submitted bearing upon the age of occurrence and the sex of the sufferers:

Foster	895	683
Futcher	179	97
W. L. Brown	182	71
J. C. Wilson	81	54
A. R. Edwards	60	40
	(with 76% between 30 and 60 years of age)	
Osler & McCrae	3      to      2	
	(and ages mainly from 30 to 60)	
A. R. Stevens	more males than females	
	(with ages mostly from 40 to 60)	

Women have a low resistance to the disease, and the death rate is high. This would increase the proportion of disability claims on males.

Laache had 17 deaths in 77 male diabetics, and 40 deaths in 45 women diabetics.

Strümpell says that males are much oftener attacked than females, and that most cases occur in early mid-life.

Anders also declares that the males suffer much more frequently than females. The age varies from 35 to 60.

Ontario by latest report had a death rate of 171 males and 227 females. In Canada there were reported deaths among 292 males and among females 345.

The explanation for the fact that, though there are fewer cases of diabetes mellitus among females than among males, the death rate is much greater, is the much lower resistance of women to the disease. This has the effect of increasing their mortality claims but lessening their disability claims.

### 3. Renal Tuberculosis

This disease may cause long periods of invalidity. One case can be recalled that lasted four years, totally disabling the subject.

Stevens asserts that there are more male than female victims.

Anders agrees with the teaching that there are more cases among males than females.

In Ontario there were 14 deaths among males and 11 among females. Their ages ranged from 20 to 60. The Canadian mortality statistics give 30 male and 23 female deaths, with ages from 15 to 65.

### 4. Kidney Calculus.

Anders is of the opinion that more males than females have stone in the kidney.

A. Stevens says more men than women.

A. G. Rytina states that males are more frequently affected than females. In 188 cases Morris gives the age incidence thus:

Under 10	1
10 to 15	10
15 to 20	20
20 to 30	54
30 to 40	50
40 to 50	34
50 to 60	17
60 to 65	2

#### 4. DISEASES OF THE JOINTS AND MUSCLES

##### 1. Diseases of the Joints

There are two chronic joint diseases that may well claim some consideration. These are Arthritis Deformans and Joint Tuberculosis.

(a) Arthritis Deformans fortunately is not common; for the invalidism may be a prolonged one.

Tyson is of the opinion that more females suffer than males, and especially if they have not borne children.

Garrod published a series of cases consisting of 89 males and 411 females and the ages ranged from 20 to 50.

McCrae found the sexes equal or 250 of each. Most cases of spondylitis are males, and McCrae included them in his series, thereby increasing the number of males.

F. A. Clarkson from Hospital for Incurables reports during the past five years 16 cases in males and 23 in females.

J. M. French puts the age of onset as ranging from 35 to 55, and that the disease is much more common among women than among men.

Strümpell regards it as decidedly more common in women than men.

Stevens says that women suffer oftener than men.

The Cambridge Committee found that the disease appears between the ages of 20 and 60, and that the Committee tabulated 303 males and 921 females. At least 74% of the cases occur within the age limits above mentioned.

If such cases were numerous women would certainly not be desirable candidates for the disability benefit. But they are very rare. According to the Canadian and Ontario vital statistics there were very few deaths from joint diseases, of which this type might form some of them. As a factor against the granting of the total and permanent disability benefits to women it is almost negligible. According to careful observation there is only about one case in every 100,000 of the population.

(b) Tuberculosis of the joints may cause prolonged invalidism. The joints likely to do so are those of the spinal column, the hip, the knee, the ankle, the elbow and the wrist.

In Ontario tuberculosis of the joints caused the death of 19 males and 18 females. Of these 3 males and 3 females were under the age of 15 years. In Canada there were reported 75 deaths among males due to tuberculosis of the spine or some joint. Of these 15 were under 15 years of age. There were 44 deaths similarly caused among females, with 16 of them under 15.

The ratio of the ill to those who died would be fairly even and regular, so that a reasonably correct estimate can be formed that of these ailments there are

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about 2 males affected to 1 female. As a matter of practical insurance policy there is nothing here to prove any barrier to the granting of the disability benefits to females.

(c) Inflammatory rheumatism is mentioned here because of its joint manifestations. Stevens, Osler and McCrae, and many others, and numerous hospital records prove that it is undoubtedly more frequently met with among males than females. This is highly important as it is the foundation for so much heart trouble in later life. Companies all realize what this means in the matter of disability claims.

2. Muscular Atrophies and Dystrophies.

Under this heading four forms of disease may be grouped. They are all steadily progressive and incurable, and in time reduce the victims to complete helplessness.

(a) The first form is known as chronic spinal muscular atrophy, caused by a wasting in the anterior cornual cells of the spinal cord. The disease is three times as frequent among males as among females, and makes its appearance between the ages of 25 and 45. Gowers, Osler, Stevens and all observers agree in this ratio.

(b) The second form is that known under the name of pseudo-hypertrophic muscular paralysis. There are from 4 to 7 males to every female affected, and the disease usually begins between the ages of 15 and 20.

(c) The third variety is known as simple muscular atrophy. The sexes are affected about equally and

the disease in the majority of instances commences between 15 and 35.

(d) The fourth form is called the peroneal type of muscular atrophy. The disease begins in the peroneal group of muscles, and gradually extends to the muscles of the entire body. Males suffer twice as often as females, and the disease makes its appearance usually between the ages of 10 and 20 years.

This group of joint and muscular diseases on the whole are quite favorable to the female applicants.

## 5. DISEASES OF THE RESPIRATORY ORGANS

There are some diseases of the respiratory organs that give rise to more or less lengthy periods of inability to follow any avocation or perform any active duties.

### 1. Bronchial Asthma

This disease, according to Anders, is twice as frequently encountered among males as females. This is confirmed by Boston and Stevens.

Norris and Landis place the relative frequency in the sexes at 66 males and 34 females. A. McPhedran places it at 65 and 35. Osler gives the ratio as 60 and 40; F. W. Price puts the frequency at 63 and 37; H. Salter found it to be 67 and 33; A. R. Edwards observed 66 males to 34 females; W. H. Thomson puts the ratio at 2 to 1; Tyson points out that it is more common among males.

Turning to the deaths due to asthma we find that there was 38 males and 36 females in Ontario. In Canada there were reported 40 deaths among males

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and 28 among females. This ratio of deaths bears out the statements of clinicians regarding the greater frequency among males.

### 2. Chronic Bronchitis

This is another disorder with marked preference for males. According to the following we learn:

Warren	7 to 5
Norris and Landis	2 to 1
J. C. Wilson	3 to 2
Osler & McCrae most frequently in adult males.	
Strümpell	mostly in adult and elderly men.
James Tyson	mostly met with in men.

In Ontario between the ages of 15 and 64 there were 13 deaths among males, and 8 deaths among females. The death ratio corresponds to the sickness incidence of this disease.

### 3. Pulmonary Tuberculosis

Pulmonary tuberculosis is the most frequent form of tuberculosis. It may be acute or chronic. The acute form is generally met with in the young, and, as it runs a rapid course, does not specially tend to cause total and permanent disability claims. The chronic form of pulmonary tuberculosis usually assumes three types: the bronchial-ulcerative, the caseofibrous, and the fibroid. The best clinicians today admit that these types are more commonly met with among males than females.

During the past five years the Muskoka Hospital for Consumptives admitted 1,170 males and 921 females. This may be taken as a fair indication of the sex

prevalence. Children are placed in another institution. The above cases are, therefore, adults.

Kingston Fowler gives some very illuminating figures, as shown in the following table of mortality:

	15-20	20-25	25-35	35-45	45-55	55-65	Total
Males	2,088	3,676	3,941	4,097	3,850	3,274	20,926
Females	3,008	3,708	4,165	3,826	2,812	2,075	19,594

This shows that under 35 years of age there is slightly more females affected than males, but after 35 there are more males. Taking the whole period from 15 to 65 there were 1,332 more males than females. These figures are for each million of the population, and are for all forms of pulmonary tuberculosis. These figures clearly prove which sex will produce the largest number of disability claims.

Anders is on record as stating that fibroid phthisis is found mostly among men.

Strümpell states that under 30 there are more women, but after 30 there are more men ill with pulmonary tuberculosis.

In Canada the last report gives 1,581 male deaths, and 1,571 female deaths from pulmonary tuberculosis between the ages of 15 and 64.

#### 4. Emphysema of the Lungs

C. F. Jermain, who has gone into this condition of the lungs, concludes that it occurs generally at and after mid life, and that it is decidedly more frequent among males than females. So much so is this the case that it has been regarded as a man's occupational disease. It is slowly progressive. Any disability claims arising out of this condition would be almost entirely limited to males.

Tyson also concurs in this view that the complaint prevails mainly among males.

#### 6. DISEASES OF THE VASCULAR SYSTEM

Diseases of the vascular system are responsible for many of the claims for total and permanent disability benefits. The discussion of this subject readily divides itself into a study of the heart and the arteries.

##### 1. Diseases of the Heart

(a) Myocarditis: Norris and Landis give the causes of myocarditis to be high pressure living, hard labor, chronic infections, syphilis and arteriosclerosis. These causes affect men mostly, and consequently myocarditis is a disease that affects this sex chiefly.

Tyson holds that myocardial degeneration is caused principally by coronary artery sclerosis, and makes it a condition affecting men much oftener than women. It is met with in mid and later life.

Strümpell teaches that myocarditis is a condition of the second half of life, and the causes leading up to it make it an impairment more common to men than women.

Anders points out that myocarditis is caused mainly by alcohol, tobacco, lead, gout, rheumatism, diabetes, nephritis, malaria and syphilis, and naturally appears oftener in men than in women. Myocardial degeneration sometimes follows cardiac hypertrophy, males predominating in this condition.

R. C. Cabot estimates the causes of myocardial degeneration thus: rheumatism, 45% syphilis, 12%; nephritis, 20%; arteriosclerosis, 15%; goitre, 5%; other causes, 3%. All told males and females suffer in the ratio of 108 to 100.

Lindsay Stevens gives the ages as from 40 to 70, and in the ratio of 2 males to 1 female.

My own cases are in the ratio of 55 males to 45 females.

In Ontario per latest report the deaths due to myocarditis were, males 230, females 212. Not all these would have been claimants for disability benefits prior to their deaths, but such as would have been claimants would be very closely in the ratio indicated by their deaths.

There can be no doubt left that males suffering from myocarditis are subjects for disability claims considerably in excess of females.

(b) Valvular diseases constitute a very numerous and important group. As disease of the valves results from endocarditis, this condition need not be considered apart from the valvular diseases resulting from it.

F. G. Finley, Gillespie, Norris and Landis, Tyson, Osler and McCrae, Anders and T. F. Reilly all agree that aortic valvular disease is caused mainly by syphilis and hard work, and that it is almost exclusively a disease of men. Osler and McCrae state in a series of cases there were 621 of the mitral valves, 380 of the aortic, 46 of the tricuspid and 11 of the pulmonary valves. Osler regarded about 75% of aortic valvular disease was caused by syphilis. About 30% of all valvular disease affects the aortic valves. These writers are agreed that aortic valvular disease in men and women is in the ratio of about 4 to 1. This form of heart disease seldom appears before mid life. G. A. Gibson records 354 males to 57 females.

Mitral valvular disease is the most common form of valvular disease, constituting approximately 60% of all cases of valvular disease. All the observers quoted are agreed that the outstanding cause is inflammatory rheumatism. When mitral insufficiency comes on about mid life it is usually due to arteriosclerosis. Mitral stenosis constitutes but a small percentage of disease in the mitral area, and is mostly found in young women. Osler, in a series of cases, found 89 in males and 107 in females. Gibson found 597 males to 523 females.

With regard to mitral insufficiency, Norris and Landis think that of the cases coming on among the young, slightly more than half are in the female, but at mid life most of the cases are in males. F. G. Finley thinks that both sexes are afflicted about equally. Strümpell on the other hand regards women as the more frequent victims. Hirschfelder, Tyson, Anders and my own cases show that it occurs most frequently among males.

Tricuspid valvular disease represents a little less than 4% of all valvular diseases. Stenosis of the tricuspid valves is so infrequent as to be negligible. Tricuspid insufficiency is often the result of high blood pressure, or dilatation of the right ventricle. It is really an increase of a normal condition. Finley, Anders and others are agreed that this form of valvular disease affects males much more frequently than females. Tyson gives the following figures: 271 followed mitral valve disease, 68 from myocardial degeneration, 55 pulmonary disease, while 11 seemed to be primary. One of the characteristic features of tricuspid insufficiency is pulsation in the veins of the neck and liver.

Disease of the pulmonary valves is usually congenital and too rare to call for any discussion.

(c) Endocarditis, dilatation and hypertrophy have been incidentally touched upon while discussing other forms of heart disease. Endocarditis is of note as the cause of valvular disease. Dilatation is the evidence of a failing heart muscle and a frequent result of valvular disease. Hypertrophy is one of the results of valvular disease, high blood pressure, nephritis, and perhaps, strenuous physical exertion. These conditions have the same bearing upon sex invalidism that their causes or effects have, as already mentioned. Cardiac hypertrophy is specially an impairment of males. Gibson and Gillespie, Royal Infirmary, Edinburgh, in 2,368 cases of heart disease, found 26 examples of this among males, and 24 among females. Kelynack, a well-known London pathologist, found that males and females had endocarditis in the ratio of 68 and 32%, and Kanthack and Tickell found in St. Bartholomew's Hospital that the ratio was 61 and 39% respectively.

(d) Pericarditis is not often a cause for disability claims. G. A. Gibson states that in the Royal Infirmary of Edinburgh, out of 2,368 cases of heart disease there were 119 instances of pericarditis, 68 being males and 51 females. A small percentage of each became chronic invalids. The investigations at the Charité in Berlin show that of all heart cases 2.5% have an adherent pericardium, some of whom may become disability claimants.

In Canada the reported deaths from pericarditis, endocarditis, myocarditis, and valvular disease were 1,296 males and 1,181 females for ages ranging from 15 to 64. It is here seen that a wide study of heart

deaths goes to prove that both in cases and deaths males suffer most.

(e) *Angina pectoris*: This condition is most generally met with in males and after the age of 40. When it causes disability the incidence would mainly be among males.

## 2. Diseases of the Arteries

(a) *Aneurism*: Aneurism may give rise to lengthy periods of complete disability. Aneurism of the aorta is to a very large extent the result of syphilis. Careful clinicians and pathologists place the percentage as high as 80, due to this disease. Aneurisms of the coronary arteries, so potent in damaging the heart, of the cerebral arteries producing many brain disturbances; and of other parts of the body, are to a very great extent caused by syphilis or arteriosclerosis. A. S. Warthin is quite positive that these conditions afflict males much more frequently than females.

Anders and Boston are quite of the opinion that aneurisms are met with among males more frequently than among females, and that the prevailing ages are from 30 to 50. J. C. Wilson also states that the condition is most prevalent after mid life, and among males.

Hodgson had 56 cases of aortic aneurism among males and 7 among females.

Bizot reported 171 males and 18 females with aortic aneurism.

Crisp and Browne, in a total of 668 cases of aortic aneurism, observed that nearly all of them occurred between the ages of 30 and 60 years.

Crisp reported,	487	males	67	females
Agnew,	243	"	26	"
Lisfranc,	141	"	13	"
Richter,	678	"	58	"

This gives 11 males to 1 female, and that nearly all the cases fell within the age limits of 20 to 70.

In 530 cases, 234 were in the aorta (thoracic or abdominal), 203 in the arteries of the legs, and 66 in the arteries of the neck and upper extremities.

The causes are syphilis, alcohol, tobacco, hard work, gout, nephritis and some infection. Of all these causes syphilis occupied a most prominent position.

In Canada and Ontario the deaths due to aneurism from the ages of 15 to 64 were 72 males and 20 females.

(b) Arteriosclerosis: All admit the prevalence of this condition and its far reaching and injurious effects on health. It damages the nervous, digestive, muscular and vascular systems, and, in conjunction with chronic nephritis, spreads its tentacles far and wide.

Strümpell, Anders, Boston, Wilson, Stevens, Edwards, Tyson, Osler and McCrae, all agree that this condition is more frequent among men than women. Some of these authors use such terms as "decidedly more frequent," "much more common," etc., Edwards claims that 80% of the cases are males.

This frequency is explained when one examines the causes, such as syphilis, intoxications, stress and strain, overeating, renal disease, hypertension and overworking of the muscles.

Harlow Brooks found 275 cases among males and 125 among females.

My collection of cases from various hospitals gave 651 males and 345 females.

In Canada between the ages of 15 and 64 there were 397 male deaths and 292 female deaths.

(c) Apoplexy: There are two forms of this disease, that in which a vessel in the brain ruptures, and the other when a cerebral vessel is closed by a blood clot, thrown into it from a diseased heart, or formed in a diseased vessel. These forms of obstruction to the cerebral circulation may cause long periods of invalidism. The question of how frequently males and females are affected becomes very important.

Johns Hopkins Hospital,	489	males	251	females
Church and Peterson,	427	"	285	"
A. R. Edwards,	80	"	20	"
Gintrac,	385	"	296	"

Osler and McCrae, there is a marked preponderance among males.

A. R. Stevens, more men than women.

James Tyson, more common among males.

Anders, much more in men than women.

L. Putzel, the large majority are males.

Strümpell, decidedly more males.

With regard to age, Osler and McCrae speak in these words, "Apoplexy after 30 increases with each decade up to 60, when its incidence gradually declines." Other writers agree with this.

The deaths in Canada from apoplexy call for a few remarks. By the official report, from ages 15 to 64, there were 313 male deaths, and 354 female deaths. This brings out the important fact that though males suffer oftener, females die oftener. In other words fewer female apoplectics yield more deaths than a larger number of male apoplectics. This higher mor-

tality rate among females was also shown to be the case in diabetes.

It will be observed that apoplexy usually discussed among nervous maladies, is here grouped with the diseases of the vascular system, because it is here that the true cause is found.

#### 7. DISEASES OF THE NERVOUS SYSTEM

In dealing with this large and important group of diseases, they shall be taken up under the headings of diseases of the brain, of the spinal cord, the peripheral nerves, and the functional disturbances.

##### 1. Diseases of the Brain

(a) Tumors: Tumors of the brain may be caused by syphilis, tuberculosis, or new formations as gliomata, gliosarcomata, rare fibromata and cysts.

A. Stevens holds that males are more frequently attacked than females. Gowers gives 440 males to 210 females. This marked prevalence in males is due to the frequency of syphilis, tubercle, gliomata, and traumatisms. Alfred Gordon lays it down that brain tumors are much more frequent among males than females. These statements are borne out by the experience of others, and hospital records. There is usually a considerable period of invalidism.

(b) Paresis (Dementia Paralytica): This is markedly a disease of the middle life of males.

B. Sacks gives	65	5
Fournier	87	12
A. R. Edwards	89	11

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Brower and Bannister	6 to 1
Anders, more frequently among males.	
G. H. Savage	10 to 1
London County Asylum	1,099    231
Whitby Asylum (since opened)	66       25
C. S. Potts, mostly males.	
Strümpell, men much oftener than women.	
James Tyson, decidedly more men.	
Osler and McCrae, much more males than females.	
My own cases	17       2
Collected by me	73       8
Last year asylums in Ontario admitted	73       19

Mattauscheck found that out of 4,134 syphilitics, 300 became paretics. F. W. Mott finds that about 4% of syphilitics became paretics or ataxics. J. H. Stokes tells us that from 1 to 6% of syphilitics become ataxics or paretics. This difference is due to the care given to treatment in the early stages of the syphilis, and varies with the classes of people. All writers are agreed that the usual ages are from 25 to 55.

In Ontario, latest report, there were between the ages of 15 and 64, male deaths 56, and female deaths 13, and for all Canada 101 and 23 for the same ages.

(e) **Insular or Multiple Sclerosis:** This disease is included here because it affects the brain more than the spinal cord.

W. R. Gowers regards this disease as about equal in the two sexes.

Osler and McCrae found the disease to occur mostly between the ages of 15 and 30, the majority of their cases being women.

Tyson regards the disease as about equal in the two sexes, the ages ranging from 18 to 35.

Anders found the disease to be of equal prevalence in the two sexes.

Insular sclerosis of the brain or cord is a rare disease with long periods of invalidity, and of about equal incidence in the sexes.

## 2. Diseases of the Spinal Cord

(a) Locomotor Ataxia or Tabes Dorsalis: This is a post syphilitic disease.

Gowers, Tyson and Anders admit that the disease is 10 times as frequent in men as in women, and that most cases appear between the ages of 30 and 50.

In Johns Hopkins Hospital there have been ten men affected to one woman.

Church and Peterson give,	90 to 10
Mendl,	3 to 1
Osler,	182 " 19
Edwards,	91 " 9
Hospital for Incurables,	17 " 4
My own collection,	253 " 31
Stevens, men much oftener than women.	
J. A. Ormerod, far more men than women.	
C. S. Potts, males most frequently.	
W. M. Leszynsky, men to women in the same proportion that syphilis, or about 8 or 10 to 1.	

In Ontario, as per report, there were eleven deaths among males, and 3 among females, between 15 and 64. In Canada there were 27 to 12 deaths, and of the same age as in Ontario.

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Mattauschek and Pilez found that 2.7% of syphilites become ataxics, Stevens claims that about 5% become ataxics, while F. W. Mott gives the percentage as 3 or 4.

(b) **Bulbar Paralysis:** In its chronic form is a rare disease, but according to Gowers slightly more frequently met with in men than in women.

Tyson states that it is a disease of adult life, and more men than women suffer from it. These opinions may be accepted as those generally held.

(c) **Ataxic Paraplegia:** This is a rare disease, commencing usually about 30 to 40 years of age, and particularly a disease of males.

Tyson holds that it is a man's disease, and of the mid life period.

Gowers gives the ages of onset as 30 to 40, though occasionally as late as 50, and much more common among males than females.

(d) **Lateral Sclerosis:** Gowers regards both sexes as about equally liable, and gives it as a disease of mid life.

Anders on the other hand is inclined to think that more males than females are afflicted with this condition.

Tyson is quite of the opinion that there are more males afflicted than females, and that the ages range from 20 to 40.

(e) **Syringomyelia:** Clinicians tell us that this is a rare disease, that it appears between 10 and 40, and mainly attacks males.

(f) **Myelitis:** Apart from the diseases of the spinal cord already discussed, there should be some attention given to chronic inflammation of the cord involving its entire diameter, and not merely certain tracts. This condition is one of adult life, and most common among males.

Gowers states in the first half of life there are more females affected, and in the latter half of life there are more males. As it is a disease mainly at and after mid life, males will yield the larger number of cases.

Chronic myelitis often follows the acute form of the disease, which is experienced more in males than females.

(g) **Tumors:** Gowers found that males suffered oftener than females. This is also true of Pott's disease and injuries.

In Canada the deaths from the ages of 15 to 64 were ataxia 29 males, and 12 females; and for all the other forms of spinal cord diseases 102 males and 73 females. These figures show a distinct predominance or organic diseases of the spinal cord in males.

### 3. Diseases of the Peripheral Nerves.

(a) **Multiple or Polyneuritis:** Strümpell in giving the causes of this condition makes it clear that males suffer most frequently.

Gowers gives the prevailing ages as from 20 to 50. He states that a considerable number of women suffer with multiple neuritis as the result of drink. This is not much in evidence in North America. Setting this group aside, men suffer most frequently.

Tyson also gives the larger number of cases to the

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males. He admits that an intemperate woman is more liable to the disease than an intemperate man. But this is not serious in life insurance.

In studying hospital records and the reports from private practice I have collected 453 cases of multiple neuritis. Of these cases 259 were males and 194 females. Arsenic, lead, drink, syphilis, diabetes and infections are the chief causes.

Multiple neuritis is often a very protracted illness and a completely disabling one.

(b) Neuritis of single nerves may be very chronic and invalidating. The principal forms are:

Trigeminal—Head, Rose, Patrick and Fothergill are agreed that in this type of neuritis slightly more women than men are affected, but the difference is not great. The age is mid life and later.

Sciatica is another form of single nerve neuritis. Gowers gives the ratio of men to women as 5 to 1. E. V. Gibson collected 884 cases among males and 116 among females. The ages range from 30 to 60. Neuritis due to injury is naturally most frequently met with among men, and in the active period of life.

### 4. Functional Diseases of the Nervous System.

(a) Paralysis Agitans: This disease is included here although it is really due to some degenerative process in the brain and higher nerve centres, and ends fatally.

Gowers gives the ages as from 40 to 60, and reports 73 cases in men and 42 in women.

Philip Zenner records 19 men and 11 women.

Strümpell regards the sexes as about equally affected, and that the disease is very rare under 35.

Stevens,	3 to 2
König,	12 " 11
Church & Peterson,	66 " 34
D. J. McCarthy,	63 " 37
J. R. Hunt,	2 " 1
A. R. Edwards,	66 " 34
Hospital for Incurables,	4 to 7 (10 years)
Osler, more men than women.	

Stevens states that nearly all the cases fall in between 45 and 65.

Tyson puts the ages as from 30 to 60, and gives males 14 and females 11.

In Canada the deaths are not given separately from other forms of paralysis.

(b) Epilepsy; According to Gowers under 20 years of age females suffer more frequently than males, from 20 to 30 the sexes suffer equally, from 30 to 40 the males are plus, and from 40 to 50 the males are double plus, after fifty males only. About 45% of all cases commence under 20.

A. M. Hamilton gives a table showing that under 20 there were 192 males and 274 females, and that over 20 there were 277 males and 237 females. The total number of males was 469 and females 511. Under 15 years of age there was 144 males and 188 females, this leaves 325 males and 323 females over 15 years of age.

Turner (all ages)	559	441
Spratling "	948	632
Sinkler "	542	482
Gowers "	1,193	1,207
Osler "	232	203
Binswanger (per 100)	62	38
Lange	5 to	4
Berger (per 100)	64	36

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C. S. Potts states about 45% occur under 20 years of age. Those commencing after 25 years of age are mostly males.

Osler and McCrae give figures covering 1,450. Of these 428 began before 15 years of age. Of the remainder, 1,022, the males were slightly in the majority.

Tyson states the cases beginning after 15 years of age yield a majority of males. In the Hospital for Epileptics at Woodstock, Ontario, during the past five years 74 males and 56 females have been admitted.

The following table from the Craig Colony gives the ages of 5,641 epileptics at the time of their admission.

under 5	62	40-45	243
5-10	370	45-50	188
10-15	942	50-55	117
15-20	1,252	55-60	82
20-25	961	60-65	48
25-30	570	65-70	22
30-35	451	70-75	7
35-40	323	75-95	3

This shows that there were 4,183 between the ages of 15 and 60, the period over which disability claims are usually admitted for payment. The total males were 3,313 and the females were 2,789.

In Canada there were reported 99 male deaths and 69 female deaths, and in Ontario 53 of each sex. All these deaths were within the ages of 15 to 64. These figures seem amply to prove that both morbidity and mortality are heavier among the males than the females.

(c) *Neurasthenia*: Few diseases have been more dis-

cussed than neurasthenia since Beard coined the name in 1869. The stigma of this complex of symptoms has been very generally fastened upon women, but a careful study of the statistics shows that men yield the majority of victims.

Gowers teaches that neurasthenia makes its appearance during the active working period of life. That when it appears in women it is mostly among those under nervous strain, making their living, or having undergone some disappointment.

A. R. Stevens claims that more men are affected than women.

Anders holds that men yield the majority of the cases, and the ages are from 20 to 50.

Tyson also tells us that it is most frequent among males during the working period of life.

Hössling reports	604	228
Church & Peterson (per 100)	50	50
C. W. Burr	55	45
Boston & Anders	60	40

Edwards states that there are more neurasthenic men than women, that this infirmity makes up 50% of all the neuroses, and that 75% of the cases fall between 20 and 50 years of age.

T. D. Savill, who writes an excellent book on neurasthenia, records 157 hospital cases thus: under adolescence, 15%; middle life, 65%; advanced age, 20%. There were 96 males and 61 females. He also gives 103 cases from private practice. Of these 55 were males and 48 females. The average age of the males was 40 and of the females 38. Of these cases 3 were under 19, and 3 over 60 years of age. Chief causes given by the author are, malnutrition, grief,

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emotional strain, continued pain, and occupations such as teaching, nursing and clerking, the struggle to hold positions and to perform allotted duties, with constant fears and anxieties, make many a neurasthenic.

With the object of determining the influence of the married or single state on the production of neurasthenia, a collection of 150 cases were made. Of these 99 were single, 27 were married, and 24 were widows. There were 83 males and 67 females.

These figures as herein submitted are from the ablest of clinicians and should go a long way to correct the misconceptions of the past.

(d) Traumatic Neuroses: There are no available figures to reveal the relationship of this condition to sex, but the most experienced clinicians believe that it is more common among males than females. The nature of men's occupations exposes them to injuries, shocks, frights, etc. These neuroses are combinations of physical and psychical derangement. Though not a frequent cause of disability the illness may be quite prolonged.

### 8. DISEASES OF THE GLANDS

#### 1. THE THYROID GLAND

(a) Exophthalmic Goitre: It is admitted by all that this is pre-eminently a disease of females.

Edwards	10	80
Eshner	39	161
Church and Peterson	36	216
Murray	10	170
Ruschan	163	817
Butler	16	48

Stevens	543	2,933
Sattler (in 3,477)	1	6
Tyson	1	6

As to age, Tyson says mostly in young adults. In Sattler's 3,477 cases only 184 were under 16 years. Gowers gives the ages from 15 to 50 for most of the cases. All are agreed that it is rare after 50.

In Canada there were reported 15 deaths among males, and 126 among females, from the ages of 15 to 64. In Ontario there were 6 and 43 respectively of the same ages.

From the aspect of granting disability benefits to women this would look like a very black mark. It admits, however, of some modification. The almost universal treatment of this disease surgically has wiped out the long periods of illness with which some of us were so familiar a few decades ago. Exophthalmic goitre is not now the cause of lengthy periods of invalidism.

But it may be argued that the brilliant results of the surgical treatment is to a considerable extent lost in a few years, and many of the cases again fail into ill health. This is known to cause some increase in the mortality rate, but not in the disability. Very few of the cases that have undergone operative treatment become wholly disabled. This statement is based on well known clinical experience.

(b) Myxoedema: This disease is so rare as to be almost negligible so far as disability insurance is concerned. It is admitted that women are the chief sufferers, but judicious treatment relieves the symptoms and prolongs life. Very rarely do these cases sink to the level of becoming disability claimants.

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2. DISEASES OF THE PANCREAS

Degenerative diseases of the pancreas usually appears in men from 40 to 60. In the event of cancer there may be a disability period. Should the disease cause diabetes, this would be an added chance for a disability. At any rate such claims would be made by males, as a general rule.

3. DISEASES OF THE PITUITARY GLAND

The only result of disease of this gland that need be now mentioned is acromegaly. This condition is very rare. Osler thinks it is more often met with in women than in men. Stevens, with others, thinks it is more common among males. Its great rarity makes it negligible.

4. DISEASES OF THE PROSTATE GLAND

Cancer and tuberculosis of the prostate gland are quite infrequent maladies, and will not cause many disability claims. Hypertrophy of the prostate is a fairly common disorder, but as it very seldom causes any serious trouble prior to the age of 60, it calls for but little attention, so far as disability claims are concerned.

9. SOME SPECIAL DISEASES

It may be well now to give some close attention to a few diseases that figure prominently in disability claims, and compare how males and females stand towards each other in the matter of frequency of this group of diseases.

1. Syphilis

One of the first things to consider is the prevalence

of the disease. The following table from Sir Wm. Osler is very instructive:

Deaths due to Syphilis in Britain—1915:

Sir W. Osler	No. of Deaths	Due to Syphilis
General Paralysis	2,263	2,263
Locomotor Ataxia	735	735
Other diseases of the cord	2,846	1,500
Cerebral Haemorrhage (Apoplexy)	25,423	3,000
Softening of the brain	1,472	540
Paralyses (no specified cause)	2,983	500
Other nervous diseases	15,000	2,000
Aneurism and Aortitis	1,141	1,000
Organic heart disease	56,000	5,000
Diseases of Arteries	10,000	3,000
	<hr/> 117,863	<hr/> 19,498

The vital statistics of Canada make it clear that there are 3 male deaths to 1 female death. This would be a fair key to the proportionate amount of invalidism.

In Canada for the years 1921-22-23-24, the following deaths were directly due to syphilis:

Syphilis	593	259
Ataxia	140	50
General Paralysis of Insane	409	91
	<hr/> 1,142	<hr/> 400

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To these must be added the proportion of deaths from aneurisms and cerebral haemorrhages, and some other deaths due to syphilis attacking other parts of the body.

In Ontario, by recent returns, there were deaths due to syphilis, ataxia and paresis, males 440, females 163. These figures give some idea of the frequency of the disease in the general population and in each sex.

Dr. Douglas White, after a careful study of the subject, concluded that there were in Great Britain about 3,000,000 syphilitics, or about 7% of the total population. It was estimated that about 5% of the rural population, and 10% of the urban population had the disease.

In Ontario there are 18 special clinics for venereal disease. During the year 1925 there were admitted as in-patients 501 males and 435 females. In the out-door departments there were admitted for treatment 677 males and 508 females. Now, it must be remembered that these public clinics deal chiefly with the lower and foreign grades of the people. This accounts for the large number of females, almost equal to the males. This is not a true ratio for the whole population.

Different statistics vary somewhat as to the proportion of males to females infected; but to state that of every four cases three will be males would be not far from the truth. Fournier collected 12,322 cases among males, 3,949 among females.

Of the total deaths from all cases those due to syphilis would be from 5 to 11%, according to the classes of the people, and whether rural or urban.

Another point of much importance is that with few exceptions women have the disease in a milder form than men.

All these facts count very decidedly in favor of females so far as this disease is concerned.

## 2. Cancer.

All statistics show that if cancer of the breast and uterus are excepted, the morbidity and mortality rates are greatest among men. In the registration areas cancer represents 6.56% of all deaths.

According to D. Buckley since 1901 the cancer rate has been increased among males 32% and in females 25%. He states that there are 2 males to every 3 females afflicted.

The following table, taken from the United States registration area, is quite interesting:

### Cancer Mortality—Age and Sex.

United States Registration Area, 1903-1912.

#### MALES

Ages	Total Population	Cancer Deaths	Rate per 100,000
Under 35	152,383,432	6,955	4.6
35-44	33,235,346	10,750	32.3
45-54	23,174,947	24,431	105.4
55-64	13,726,350	35,327	257.4
65 and over	10,416,027	52,126	500.4

#### FEMALES

Under 35	148,381,116	10,719	7.2
35-44	30,097,450	26,779	89.0
45-54	20,941,618	46,669	222.9
55-64	13,042,548	50,393	386.4
65 and over	10,953,837	67,611	617.2

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W. P. Graves tells us that primary cancer of the uterus occurs about equally in the single and the married, and in the latter especially if they are nulliparous. Cancer of the cervix is decidedly more prevalent among women who had borne children. The duration of cancer of the uterus is about 1 to 3 years, but only a short period is one of total disability. Cancer of the cervix according to Thomas Watson makes up 87% of all uterine cancers; and per one thousand women cancer of all forms occurs much more frequently among widows than married women, due to the facts that they have been married, and that they now do not receive the same care, and that they have more hardships. Widows are not, therefore, as good risks as are married women, especially for disability benefits.

With regard to cancer of the breast, C. C. Choyce maintains that it occurs equally among single and married women, and appears generally about mid life. The soft types are very fatal and very rapid in progress. The scirrhus type is usually chronic, but there is seldom much total disability. Halstead is authority for the statement that two-thirds of the cases operated on before the glands are involved are cured.

J. C. Bloodgood states that 70% of breast cancers are scirrhus, which is the most favorable type.

The experience of two companies is worthy of attention, as an index to what may generally be expected.

## Cancer Deaths—Prudential Life.

Ordinary Business, Percentage of total male and female deaths.

	Males	Females
20-24	0.9	0.7
25-29	1.1	1.1
30-34	1.9	4.4
35-39	3.2	9.2
40-44	4.3	16.3
45-49	7.2	21.4
50-54	8.4	19.0
55-59	9.0	18.3
60-64	9.7	13.4

Mutual Life, New York, on same basis.

20-24	0.8	1.32
25-29	1.02	0.97
30-34	1.46	2.78
35-39	2.67	7.78
40-44	3.99	12.97
45-49	5.27	17.80
50-54	7.18	18.63
55-59	7.78	19.03
60-64	7.95	13.84

The statistics of Amsterdam, covering the whole population, is worthy of attention, dealing as they do with both sexes and the various organs of the body.

Mouth and pharynx	60	7
Oesophagus,	159	31
Stomach	613	464

Intestines	137	142
Liver	133	242
Uterus	-----	317
Breast	-----	158

Later on an explanation will be made that shall very materially modify the apparent seriousness due to so many cases of breast and uterine cancers.

The following table is also very important. It clearly reveals wherein the death rate in women exceeds that of males:

Cancer—By parts of the Body.

United States Registration Area—per 100,000.

Organ affected	Males	Females
Chest cavity	4.6	1.0
Stomach and liver	28.8	30.5
Other digestive organs	7.7	11.3
Female organs	-----	23.4
Female breasts	-----	14.3
Skin	3.5	2.1
Other organs	13.2	10.0
	-----	-----
	57.8	92.6

There is one observation that should be made here. Cancer in all parts of the body common to both sexes are so located, or affect organs so vital to life, that it gives rise to much suffering and invalidism. On the other hand cancer of the breast and uterus does not materially do so, and there is a comparatively low morbidity compared to the high mortality. This statement is borne out by the opinions of experts on the subject. The experience of the Independent Order

of Foresters showed that the average period of disability from cancer was a little under six months. For mammary and uterine cases it would be materially less.

It is specially true that the period of total disability in cases of breast cancer is very rarely lengthy. Whether subjected to operation or not, or whether there is a recurrence of the disease, complete invalidism is at the worst but short. In examples of the scirrhous form there is little likelihood of total disability until the very late stage of the disease.

With regard to cancer of the uterus it may be said, that while the disease is confined to the cervix there should be no total disability. When it enters the body of the uterus, the duration of the illness is usually brief, and, even of this period, there is only a short period that is likely to bring about complete inability to be around. There are, of course, a few exceptions.

When the cancer problem is impartially studied, it is by no means as unfavorable to females as the figures at first sight would appear.

### 3. Insanity.

This constitutes another group of diseases with frequently lengthy periods of total incapacity for all duties.

Ontario has a long record of hospital care of the insane, and its experience would be much the same as for other similar areas.

#### Insanity in Ontario.

##### Totals since opening of the hospitals.

Hospital	Males	Females
Brockville	2,572	2,521

Hamilton	4,914	4,790
Kingston	3,581	2,992
London	5,339	5,033
Mimico	2,544	2,264
Penetang	386	467
Toronto	8,919	8,628
Whitby	1,191	1,120
Orillia (Feeble minded)	2,171	1,915
Woodstock (Epileptics)	462	366
Cobourg (Women only)		654
Guelph (Men only)	136	-----
	<hr/>	
	32,211	30,750

### Insanity in Ontario by Occupations

### Professional:

Clergy, military, naval, physicians, lawyers, architects, artists, authors, civil engineers, surveyors, etc.

### Commercial:

Bankers, merchants, accountants, clerks,  
salesmen, stenographers, typists, etc.

### Agricultural:

### **Farmers, gardeners, stockmen, etc.**

### Mechanics—outdoor:

Railway and stationary engineers, blacksmiths, carpenters, engine fitters, sawyers, painters, police, etc.

### **Mechanics—sedentary:**

Shoemakers, book binders, composers, weavers, tailors, seamstresses, bakers, factory workers, etc.

## Domestic:

Waiters, cooks, servants, etc.	140
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## Education and Higher Domestics:

Governesses, teachers, students, housekeepers, nurses, etc.	716
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Labourers	355
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No occupation	372
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Unascertained	53
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Miners, marine engineers, railway employees, seamen, etc.	28
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Total admissions in 1925	2,299
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For the numbers so engaged to the whole population, the education group, mainly single women, yield a very large part of the insane. In this table there is clear evidence that governesses, teachers, students, housekeepers, nurses, etc., gave 716 out of 2,299 admissions. The next highest group is labourers, with 355, though the number of labourers far exceeds those in the educational and higher domestic callings in the general population.

The following figures elucidate one phase of the insanity problem: Single, 1,121; married, 938; widowed, 206; divorced, 7; separated, 18; unascertained, 8. The whole population of the Province was, between 15 and 34, single, 177,064; and married, 171,794; and for the ages 15 to 64, it was, single, 213,096, and married, 44,894.

From these figures it is seen that single persons, both men and women, yield a much larger proportion of the insane than do the married. Insurance companies, however, give the preference to single women

over married women. It is worth while here to mention the fact that recovery among the males of 4.22%, whereas among the females it was 4.48.

#### 4. Tuberculosis

This disease has received some attention while dealing with the diseases of different organs of the body. Some general remarks are now in order.

Brown and Hazel think the deaths are about equal for the two sexes. Osler gives slightly more to females. Baldwin puts the death rate as equal. Edwards tells us that under 20 the death rate is higher among females, but after 20 it is higher among males. Anders states that tuberculosis in general is less frequent among females than males.

These opinions from clinicians make it quite clear that our knowledge has not yet reached the stage of what might be regarded as conclusive proof; but it would appear as favorable to females as to males.

#### Tuberculosis (All forms) Deaths.

Maurice Fishberg (per 10,000) United States Registration Area.

	Males	Females
15-19	9.68	13.18
20-24	18.37	19.92
25-29	21.10	21.43
30-34	23.78	20.63
35-39	25.22	18.11
40-44	25.54	15.94
45-49	25.34	13.62
50-54	23.72	12.82
55-59	25.46	13.76
60-64	24.69	14.31

This table based upon such a comprehensive experience and prepared by such an eminent authority on tuberculosis should be accepted as conclusive evidence that this disease weighs most heavily upon the male sex. There is no warrant here for penalizing females.

### 5. The Vascular System.

The deaths in Canada from ages 15 to 64 due to all forms of vascular diseases were as follows:

Pericarditis	24	20
Endo and Myocarditis	116	113
Angina Pectoris	231	174
Other heart diseases	1,156	1,070
Disease of Arteries	456	310
Embolism	21	16
Disease of Veins	12	21
	2,016	1,724

This table tells us that during the working years of life deaths from diseases of the vascular system are considerably more frequent among males than females. Reasoning from these figures, we can also safely conclude that the volume of invalidism is greatest among males.

This covers the five chief killing groups preceded frequently by lengthy periods of enforced loss of time. I think it may safely be said that the balance of the accounting is in favor of the female sex in the matter of the frequency and duration of such illnesses as create disability claims. Women in large numbers hold their own when compared with males of equal numbers.

## 6. Total Blindness

The totally blind in Canada for all ages are in the ratio of 136 males to 100 females. Many of these are blind from infancy upwards, but those who become blind later in life would follow about the same proportion, with perhaps a tendency to increase the proportion of males. Here it will be seen that the lengthy disability claims from this cause would be heaviest amongst the males.

## 10. SINGLE AND MARRIED WOMEN COMPARED

This is the last aspect of the subject calling for consideration. It is proposed to show how married women compare with single women, and that they might be granted more liberal treatment than pertains at present. This can best be shown by selecting a number of diseases that usually run chronic courses prior to death.

I am not unmindful of the fact that morbidity does not always run parallel with mortality. Nevertheless, the study of mortality in some diseases can throw much light upon morbidity. While, for example, many cases of tuberculosis recover, they do not do so when they once reach the stage of total disability. So with cancer, insanity, heart diseases, and many others. The calculations are made for ages running from 15 to 64 as these are the ages given in the Ontario report. The death rate is on the basis of 1,000 of each class:

	S.	M.	Single	Married
Tuberculosis	322	374	3.11	1.68
Syphilis		3	14	0.03
Cancer	144	633	1.35	2.84

Rheumatism (chronic)	3	8	0.03	0.04
Diabetes Mellitus	21	80	0.20	0.36
Pernicious Anaemia	24	102	0.22	0.45
Exophthalmic Goitre	34	95	0.32	0.42
Anaemias (not pernicious)	18	26	0.17	0.11
Apoplexy (all forms)	46	169	0.43	0.76
Hemiplegia	5	18	0.04	0.07
Tabes & Paresis	2	11	0.02	0.05
Heart Disease	90	341	0.84	1.83
Epilepsy	35	15	0.33	0.07
Arteriosclerosis	22	189	0.11	0.84
Asthma	2	14	0.10	0.06
Gall stones & cirrhosis	4	35	0.04	0.11
Nephritis (chronic)	46	217	0.43	0.97
Female Diseases	11	89	0.10	0.40

The foregoing table appears to be rather against the married. This would be true were the single women always to remain single, but they do not. The single women and widows of today become the married women of tomorrow, with all the possibilities to disease and invalidism which the new conjugal relationship entails. The following table gives for Ontario the number of single, married and widowed females. What is true for Ontario would be practically so for other provinces and states.

Age	Single	Married	Widow
15-19	48,257	3,502	63
20-24	24,200	19,764	691
25-29	10,317	30,399	2,044
30-34	5,768	32,272	3,244
35-39	4,493	32,222	4,376
40-44	3,731	28,894	5,253

45-49	2,223	24,843	6,685
50-54	3,073	21,375	9,039
55-59	2,340	16,648	10,269
60-64	2,146	12,568	13,149

These figures show in an impressive manner how continuously and rapidly the single women pass into the married women's group, and then how they pass out of the latter to join the ranks of the widows. It seems self evident that the reasonable and practical thing to do would be to accept married women at once for disability benefits. Companies secure very little, if any, gain from the present practice of excluding married women.

Then, again, insurance companies grant disability benefits to widows. But here several things should be kept in mind. In the first place these women in most instances have borne children and laid the foundation in this way for cancer of the uterus and breasts, one of the most common and deadly afflictions of females. In the second place it is married women who most frequently contract syphilis with all its consequences. In the third place they have many anxieties due to their status that pave the way to numerous nervous derangements. Widows who are left with a competent income escape much of the trouble belonging to their class, but this is far from the general rule. Most widows of the insurable ages are but poorly provided for. They have, in most cases, to earn a living for themselves and their little children. Their lot is probably about the hardest of any in the social fabric. I make bold to assert that widows are not as desirable as married women.

I am not arguing the practice of charging women

higher premiums than are required for men for disability benefits. This might well be allowed to continue until the companies have accumulated an adequate experience for guidance in this matter.

What I am contending for is that the restriction against married women should be removed. In due time the companies would acquire an ample amount of data from which to strike a true scale of rates.

As conditions are now the companies have single, married and widowed females carrying policies featuring disability benefits. If it is improper to grant these benefits to married women, then to be logical, companies should insert a clause in their policies voiding these benefits if single women or widows married.

To me it seems much the preferable way to grant disability benefits directly to married women than to allow these benefits to them by the indirect route of the clergyman or the magistrate and the *vinculum matrimonii*.

But the important thing is that under the proposed plan as compared with the results of the present plan, the companies would not stand to lose. On the other hand they would the more speedily acquire an adequate experience, and would in the meantime be granting a form of benefit to many who desire and need it.

## DISABILITY BENEFITS

by

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Medical men who have taken up insurance work soon realize that they have entered a specialized field of medicine, and that daily new and interesting problems are arising which demand intensive study in order to bring about their solution. Our activities vary greatly, and constantly take on new and bizarre aspects. We quickly turn from subject to subject. There is not one among us who has not at some time been interested in or fascinated by the consideration of disability benefits as associated with life insurance. I do not mean altogether from the medical standpoint but from the broader and general insurance point of view.

There have been those and even today we may find some who believe that the inclusion of the disability benefits in the life insurance transaction should not be undertaken. They are of the opinion that the two are independent of each other and indeed are foreign. They feel that the disability benefits which once represented the tail to be wagged by the dog is likely to become the "wagger" instead of the "wagged."

Their reasoning is quite admissible if they allow us to infer that they are alluding to the importance of the subject. It cannot be gainsaid that the weight of this matter is almost daily becoming more and more felt.

Why are the disability benefits being sought to a greater extent at present than in the past? Is it because the agent has found the disability benefits a good talking point and that it encourages the sale of life insurance? Is it because the people are discovering the value of this particular benefit and are demanding that it be included in the life insurance? We not infrequently have it brought to our attention that the applicant refuses to accept a policy from which the disability benefit for some reason has been withheld. Or is it because of the discontinuance of the non-cancellable health policy by some companies, and the added restrictions to such policy by others, that is compelling applicants to seek a substitute which they believe is to be found in the income disability clause attached to the life policy? It is probable that all of these factors play a part and that as time goes on they will become more and more insistent.

The first disability benefit to be generally offered by American companies was the waiver of premium. This form seems to have a very legitimate place in the life insurance contract. It really was a humanitarian act on the part of insurance companies to present a proposition at a very low cost, through the function of which the life policy would not lapse during a time of distress, a period of total or permanent disability. As time went on the companies brought out disability clauses which not only included a waiver of premium but also had the added feature

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of providing a monthly income to the insured during disability. The disability proviso has been liberalized to the extent that the disability need not be actually permanent but that its existence according to certain clauses may be as brief as one month when indemnification starts.

The provisions of the disability clauses of various companies differ to certain degrees. Herewith is given a list of a dozen variances as set forth in the Report of Committee on Disability Experience of the Actuarial Society of America, dated May, 1926:

1. The insurance against disability generally ceased at age 60; in some cases it ceased at 65.
2. The premium waived in some cases was the net premium; in other cases, the gross.
3. The monthly disability income, while generally \$10 per \$1000 of insurance, in some cases was either less or more than \$10.
4. The disability income was generally of a level amount; in other cases it increased after continued disability for a specified period.
5. Some times it was required that the whole of the first year's premium be paid before a claim for disability would be entertained; in other cases, the requirement was payment of any instalment of the first year's premium.
6. Sometimes, claims for disability benefits would be entertained only if disability had existed continuously for a specified time; in other cases no such requirement existed.
7. The instalment payments in event of disability

sometimes ceased when the face of the policy had been paid, while, in other cases, payments of like amount continued during the insured's lifetime subject to his continued disability.

8. In the case of endowment insurance, the disability income generally ceased at the maturity of the endowment; in other cases it continued thereafter for life, during disability.

9. In the "Specified Disabilities," loss of hands, e. g., some policies provided for payment in event of "severance" of hands, while others provided for payment in event of "loss of use" of hands.

10. Payment of disability benefits was excluded, in some cases, in event of claims arising from military or naval service, participation in aeronautics, self-inflicted injury, police duty, foreign travel, etc., etc.; in other cases there was not such exclusion.

11. In some few cases, in the event of disability before 60, and its continuance until 60, the policy provided that the sum insured would be payable at 60—five years after disability if it occurred after age 55.

12. In the case of unmarried female risks, the insurance against disability in some few forms ceased on marriage.

At the suggestion of the Medical Board, our company appointed a committee "for the purpose of making a complete and exhaustive investigation of the subject as to this Company's experience and that of other companies issuing Disability insurance in all forms, this committee to report their findings and recommendations to the General Underwriting

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Committee." During the eight months duration of this committee on disability it collected and reviewed very much material obtained by means of a questionnaire, by discussion with underwriting executives of certain life insurance companies, and by conference with representatives of some of our local companies.

A questionnaire was sent to seventeen (17) representative life insurance companies. The queries included in this were as follows:

1. In underwriting Disability do you consider the total of disability coverage held and being applied for in all companies?
2. Do you require information concerning the total amount of health insurance carried?
3. Do you base the amount of Disability coverage you will grant upon the earned income of the applicant or do you underwrite on the basis of total income?
4. In addition to the questions in your application blank, how do you obtain conclusive information covering points asked in Questions 1, 2 and 3?
5. What percentage of a man's earned income or total income do you indemnify through the issuance of Disability with monthly income feature?
6. Your limit of Disability, we believe, is \$..... per annum in monthly payments of \$..... Some companies in addition to their own limit restrict an applicant to, say \$15,000 total in all companies of Disability and grant within their own limit up to this total limit. Do you have such a limit in addition to your own?

7. Is information requested concerning any loss of time on the part of the applicant during the past few years on account of poor health and the duration of such loss asked?

8. Is Disability with Income Feature given with non-medical insurance?

9. Do you issue Disability with extra rates?

10. Do you issue Disability with Income Feature to women and to what limits? Are there any special restrictions?

11. Disability on students. Limits and any special restrictions?

12. Disability on underweights.

13. Have you ever considered any minimum limit of Disability such as the granting of not less than \$25. per month? We are inclined to believe that experience on some of our small policies in certain localities is poor and would be interested to know if your business tends this way.

14. Have you noticed any indication of an excessive number of Disability claims from somewhat doubtful cases between ages 50—60?

15. What occupations which are not rated for life insurance do you regard as particularly unfavorable for Disability?

In our investigation it has been developed that some companies are carefully considering revisions in their Disability underwriting. We found that upon nearly all the points under consideration there is neither uniformity of action nor uniformity of opinion among

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companies at this time. Each company continues to be governed largely by its own opinion because there do not seem to be sufficient facts to indicate without question that any particular course of action should be followed.

In reviewing the material which was collected, a number of items were formulated and analyzed:

**Item Number One:** A question in the application asking for the total amount of income disability benefit in force on applicant's life under all life and health insurance policies.

Of the 17 companies investigated, 9 had a specific question along this line in their application. Four other companies do not include a specific question but before final approval of the application endeavor to obtain such data. Nearly all the companies agree that it would be desirable to have information regarding the total disability coverage in force and to be applied for if it could be satisfactorily obtained.

If over-insurance is to be avoided, and it seems right that this should be the case, then the insurer should have knowledge as to the amount of disability coverage extant and that being applied for by the applicant. This may best be acquired by asking the applicant the direct questions, and there should be no reluctance on the part of the applicant to provide such information. Over-insurance in the direction of disability coverage has occurred in the past and we have every reason to believe that the future will show great increase in this direction. Disability income insurance should not be looked upon as a bounty or a luxury but should be considered as it is intended, a partial

protection against loss of earning power during physical distress and disability. I doubt that there is a company represented here but what has been party to the payment of disability income to an insured who is drawing disability indemnity to an amount equal to several times the earned income of the insured in time of full health. Are we to encourage an increase in such practice? There seems a way to counteract this injustice.

Item Number Two: A question in the application asking if the applicant has ever received or applied for benefits under health insurance or the disability provisions of life insurance.

Five out of seventeen companies ask such a question. We feel that a Query of this nature is quite necessary. Its answer may act as a check up in part to the previous question, also we have all experienced the forgetfulness of applicants who a few weeks or months previously made a health, accident, or disability claim and were indemnified for such disability but who a little later when applying for life insurance with the disability clause have entirely failed to remember a claim of more or less recent date. The answer to this question will very often enable us to better decide the inclusion or exclusion of the disability provision.

Item Number Three: A question asking for amount of earned income exclusive of investment returns.

Sixteen of the companies stated that the amount of the disability income granted by them was based upon the earned income of the applicant; whereas the other company said with them the total income was the basis. The practice of using the earned income as the

foundation upon which to determine the extent of disability income issue is about unanimous. How shall the information be obtained? Some believe that it should come through the retail and financial reports; others say that the agent should get the data, not directly from the applicant but in other ways; a few say the question should be directly asked the proposed insured and that the answer become part of the application.

It goes without saying that the company must necessarily acquire this information. When a person asks that the disability income clause be incorporated in his life policy he is requesting that the company insure his earning power against total or partial loss in time of disability. It seems only just that if an individual desires to insure his earning power he should be willing to tell us its approximate worth to him or the extent of his loss in case of total disability. The criterion of a person's earning power is the earned income. The most authentic authority on this is the applicant himself. Insurance is a business proposition and should be met in a businesslike way. The applicant makes certain requests and the company in return asks if he is eligible for these.

We all know that financial and other reports regarding the earned income of an individual often differ by many thousands of dollars. With the development of this phase of insurance activities it will become more and more imperative that the company should secure exact knowledge of the income earned by the applicant. It seems that if not now, in the future it will be requisite that a question of this order shall be put to the applicant.

Of the 17 companies, ten limit the amount of dis-

ability income granted to \$3,000 per year, and 7 companies will issue to the limit of \$6,000 per year. The percentage of the earned income which the companies undertake to cover with the disability income clause greatly varies. Two companies issue only to a maximum of 50 per cent, four to 60 per cent, four to 66 2/3 per cent, one to 70 per cent, two to 75 per cent, and one to 80 per cent. In practically all instances those companies issuing a maximum more than 60 per cent have a sliding scale and the higher percentages are applied to risks of small amounts and to younger persons who have apparently not reached the peak of their earning power.

**Item Number Four: Maximum limit of total disability income coverage in all companies.**

Ten Companies have no fixed rule while the other companies have a total maximum limit varying from \$6,000 to \$20,000 per year. From these figures it will be seen that some companies are attempting to prevent over-insurance of the earning power. Of course this will not remedy the condition except in so far as the limit of a company is reached before application is made to the said company. Over-insurance of the earning power is a matter that will soon demand careful study and attention. It has been said that the greater the disability coverage the longer will be the period of the disability. Also, over-insurance will encourage those to whom we allude as moral risks to carry on the nefarious practice of loading above the limit with this form of insurance, and await the day when it will be better to allow the company to pay them by way of disability indemnity a sum far greater than they were able to make in the heyday of full health.

Mr. Hutcheson, in his presidential address before the Actuarial Society of America in 1920, suggested that "It may be necessary to include a provision in each company's policy to the effect that in event of disablement, if the insured is covered by several policies, each company will pay only such proportion of the income insured as its policy bears to the aggregate disability income."

It has been recommended that we exercise great care in the underwriting of Disability income benefits to applicants beyond 50 years of age; and that we grant a large percentage of disability coverage to earned income on men actively engaged in business and who have by no means approached the peak of their earning power. Also, that the disability income insurance in all companies shall in no case exceed \$15,000 per year and that the amount granted by us shall vary by percentage with the amount of earned income of the applicant, that is, in most instances the greater the earned income, the smaller shall be the percentage of such income covered with disability income benefit.

**Item Number Five: The issue of disability income benefit on non-medical insurance.**

All of the companies of our group which issue non-medical insurance will incorporate the disability income clause in policies of such types. We have for an extended period declined to grant this form of insurance without a medical examination.

**Item Number Six: Occupational disability hazards.**

A number of companies regard certain occupations as unfavorable for disability coverage although eligible for standard life insurance. Those regarded unfavor-

able by the different companies are shown in the abstract and the following occupations appear to predominate: farmers, professional men, school teachers, actors, authors, etc.

In some cases such as farmers, certain companies regard them as having a mortality better than the average and therefore are willing to grant standard disability coverage believing that the extra cost of the disability coverage will be offset by the savings in mortality cost.

There is some difference of opinion regarding students in college. A number of companies grant income disability benefits to male students for comparatively small amounts. A few companies regard them as undesirable risks for income disability until they have entered some occupation after leaving college. The question of the possibility of a student entering into an occupation which would be undesirable for disability insurance must be considered, also the fact that a number of students spend considerable time in traveling and other pursuits after graduation before obtaining a regular position.

Greater Disability underwriting consideration should be given to the matter of occupation, both those for which standard and substandard life insurance is issued. We find other companies are studying this particular problem carefully and are rating or denying Disability to those in occupations where there is not continuity of employment due to the industry or the seasons; those whose earning capacity declines rapidly in older years and those who do not go daily to a definite place of business. Our discussions with other companies have led us to believe that many consider

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the matter of occupation a very vital and determining factor in good Disability underwriting.

Item Number Seven: Substandard ratings for disability income insurance.

Ten of the 17 companies will grant the disability income provision at increased rates. These rates vary from 1 1/2 times the standard rates to 2 1/2 times the normal rates. Some restrict the extra ratings to occupational hazards; whereas others will issue on this plan to those with medical impairments. A few will not extend disability benefits to any who are not standard life insurance risks. Three companies issue to women only at increased rates. Five of the companies cancel the disability income provision of policies of women at marriage. Three companies terminate the benefit to women at 55 years of age and one at 50 years. Two companies increase the waiting period to women to 135 days and 6 months respectively. Another company reduces the monthly income to women to five dollars per thousand dollars of insurance and also incorporates the six months waiting period and terminates the benefit at age of 50 years. We recommend that the disability income provision be granted only to women who leave their place of residence and go to a fixed place of employment daily and to limit the maximum amount to \$100 monthly.

The medical insurance man is interested in disability income insurance professionally from two standpoints: First, the medical man in a large proportion of cases determines to what applicants the provision shall be granted; and second, he decides as to the allowance of a disability claim. He establishes the degree of and the permanency of the disability and fixes the duration of the period of indemnification.

Companies vary to some extent as to the practice of extending the disability income benefits to applicants. Some will grant only to those who are standard insurance risks, others will show a little more liberality and include those substandardized because of slight overweight; whereas others are quite free to give the benefits to risks which are considerably substandard.

As is commonly known, tuberculosis stands distinctly in the lead as a cause of disability. Utmost care should be taken to preclude from these benefits such persons who are believed to be especially predetermined to tuberculosis. Those especially of the younger age and low weight groups who have family histories scarred by tuberculosis. Recent exposure to and coresidence with cases of tuberculosis must be carefully weighed. Past pleurisy, and influenza, bronchitis and pneumonias of more than normal duration should be studied cautiously. It is well to withhold these benefits from those who have previously been afflicted with certain tuberculosis lesions.

Persons who have had past nervous breakdowns and who have had "spells" of overwork are not particularly good disability prospects. Persons of the younger age groups who are more than 15 per cent underweight we consider as ineligible for disability benefits. Habits and moral hazards must be thoroughly considered. All heart impairments except non-organic conditions in the younger ages, goitres, past syphilis, recent or repeated rheumatism, physical deformities, and history of recent gall-bladder disease, renal colic, and gastric or duodenal ulcer, prevent us from granting the disability benefits.

We are probably all of the opinion that the experience and statistics relating to disability are not

of the same value and extent as are those upon which we base life insurance underwriting and that as time advances changes in procedure will take place. These changes will doubtlessly be in nature, both more liberal and also more rigid. We will in the future be able to more consistently award the income disability benefits. In the meantime, one of the main considerations is the prevention of over insurance. Disability income insurance is an admirable way of protecting the earning power of the individual in time of real distress and should not be sold or purchased as a bounty or a source of extra income in advanced years. Experiences with over-insurance in this line have been had by us all. The citing of a few examples may not be mal-apropos.

Mr. X—47 years of age—the earned income of this individual at the time of application for insurance and also at the present time is estimated to be anywhere from \$4,000 to \$8,500 per annum. He is now disabled on account of total blindness, and is collecting indemnity to the amount of over \$25,000 per year from 6 different companies. One company pays to the extent of \$7,800 per year; a second \$3,000; a third \$6,000; a fourth \$6,000; a fifth \$2,400; and from the sixth company he accepted the option of \$10,000 cash in lieu of \$2,600 annual indemnity and counting 6% income from this amount per year, he is receiving \$25,800 annual indemnity when during his health his income amounted to possibly not more than \$8,500 and might have been as small as \$4,000.

Mr. Y—43 years of age—Roumanian by birth—is now receiving disability from three companies to the amount of \$7,200 per annum, one company providing \$3,000; a second company \$3,000; and a third company \$1,200. This man's previous annual earned income

has been estimated to range from \$6,000 to \$8,000, an average of about \$7,000 which makes the indemnity which he is now receiving in excess of his actual earned income during his period of health.

Mr. Z—56 years of age—disabled and drawing disability benefits to the amount of \$7,200 a year in four companies, paying \$3,000; \$1,200; \$1,800; and \$1,200 respectively. This man's income during health was estimated to be about \$4,000. He is now drawing almost double that amount in indemnity from the various life insurance companies.

Dr. Daley—I am going to call upon Dr. Martin I. Olson of the Central Life Assurance Society for his discussion of these two papers. Dr. Olsen.

Dr. Olsen—In requesting a discussion on the paper presented by Dr. Paul, our President suggested that an analysis of the Company's disability claims, with our experience and manner of investigation and dealing with certain types of claim, might be of interest. The problems concerned with the selection of risks for disability and the practice of companies generally, as revealed by the questionnaire, are brought out fully and ably by the essayist. Appreciating the fact that what is offered here is in no sense a discussion of the paper presented, and further that the experience of a small company has at the best limited value, I submit a few facts related to our claims for what they may be worth.

Some form of disability insurance has been issued by the company with which I am connected during the past twenty years, and in that time, two hundred and seventy (270) claims have been approved. A classification according to cause and status of claim shows the following: Because of the small number of claims, I include those providing waiver as well as the combined waiver and income form.

Cause	Total	Av. Dur. months	% of total claims	Active	Av. Dur. months	Rec.	Av. Dur. months	Death	Av. Dur. months	Av. Dur. months	Comp.
Tuberculosis	105	38.9	34		39		29		3		3
(1) Disease of nervous system	58	21.5	36		13		7		2		
(2) Disease of cardio-vascular-renal organs	34	12.6	15		10		9		0		
Malignant tumors	17	6.3	2		0		16		0		
Conditions resulting from accident	16	5.9	8		2		3		3		
Joint disease	8	3.0	6		1		1		0		
(3) Miscellaneous	32	11.8	14		6		11		2		
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	270	26	115	40 1/2	70	21	75	14 1/2	10		

(1) Insanity 31 cases  
 (2) Heart 15 cases, apoplexy 13, kidney 6  
 (3) Pernicious anemia 5, empyema 4, diabetes 3, exophthalmic goitre 2, gastric ulcer 3

Taking the claims in their entirety, we note that twenty-six (26) per cent have terminated in recovery or return to gainful occupation, twenty-eight (28) per cent in death, and forty-two (42) per cent are continued as active claims. A little less than four (4) per cent have been compromised. The average duration of the active cases to the present time is forty and one-half (40 1/2) months, of those recovering, twenty-one (21) months, and of those resulting in death, fourteen and one-half (14 1/2) months. The average duration from onset of symptoms to receipt of first notice was eleven (11) months.

It may also be of interest to note that our ratio of actual to expected claims insured was two hundred and forty-one (241) per cent of Hunter's and ninety-seven and six-tenths (97.6) per cent of Craig's adaptation of the Disability Committee Report, and that the termination of claims was four hundred and fifty-six (456) per cent by Hunter's and two hundred and fourteen (214) per cent by Craig's for the year 1927.

Tuberculosis, which accounts for thirty-nine (39) per cent of all claims, is followed in the order of frequency by disorders of the nervous system (including insanity), diseases of the cardio-vascular-renal group, malignancy, conditions resulting from accidents, joint diseases, and a miscellaneous group of diseases and conditions.

#### CLAIMS DUE TO TUBERCULOSIS

An analysis of the tuberculosis claims shows thirty-seven (37) per cent terminating in recovery or return to gainful occupation, twenty-eight (28) per cent resulting in death, and thirty-two (32) per cent con-

tinued as active cases, from a total of one hundred and five (105) approved claims. The average duration of the tuberculosis cases terminating in recovery was twenty (20) months, of those terminating in death, fourteen (14) months, and of those still active, twenty-nine (29) months. Of the group, twenty-two (22) cases became claims or developed symptoms of tuberculosis during the first policy year. The average duration from onset of symptoms of tuberculosis to receipt of first notice was eight (8) months. There was nothing significant in the analysis of family or past medical history. A grouping according to occupation was not made, inasmuch as the Company's business is largely rural. A large proportion of the claimants are farmers, and this may account for possible variations in the experience we have had as compared with that of other companies. An analysis according to build and age groups gave the following results:

Age groups	No. cases	% under best weight	% under average weight
15-17	8	22	5
18-22	28	12	1
23-27	33	9	4
28-32	23	7	6
33+	13	0	5
All age groups	105	9	4

From this table, it may be noted that one-third of all cases of tuberculosis occurred under the age of twenty-three (23), and two-thirds under the age of twenty-eight (28). The group as a whole is nine (9) per cent under the best and four (4) per cent under the average weight. Measured by the Best weight table, we note the more pronounced lightweights at the younger ages.

Three cases of tuberculosis reported as having re-

covered, have applied for reinstatement of their payments. One has been approved on a diagnosis of neurasthenia and arrested tuberculosis, and two are being re-investigated at this time.

#### CLAIMS DUE TO DISEASE OF THE NERVOUS SYSTEM

Of this group comprising fifty-eight (58) cases, insanity accounts for thirty-one (31) or eleven (11) per cent of all claims. Of the insane, eight (8) have recovered, and twenty (20) or two-thirds of all, continue as active claims with an average duration to date of three (3) years. Of the remaining claims in the nervous disease group other than insanity, four (4) have resulted from infantile paralysis, five (5) from encephalitis, two (2) each from multiple sclerosis and paralysis agitans, one (1) each from syringomyelia, tabes, and epilepsy, and the remainder from a group of less well defined conditions.

It may be noted that claims due to disease of the nervous system, whether primary or secondary to insult from without, show a distinct tendency to persist as active claims. Taking into account the group of nervous diseases under discussion with those which have become claims by reason of injury to the central nervous system from accident and apoplexy, we have a total of fifty-two (52) active claims from a total of eighty-seven (87) approved cases. The average duration to date of this group of fifty-two (52) active claims is five and one-half (5 1/2) years. These fifty-two (52) cases represent forty-five (45) per cent of our entire group of active cases. It would seem probable that as time goes on, we shall have an increasing proportion of active disability claims due to disease of the nervous system.

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Another point or two in connection with the remaining claims may also be of interest in connection with this study. Acute rheumatic fever is revealed as an important factor in the production of claims. The cardiac group (15 cases) is made up largely of rheumatic heart cases, and most of the joint cases (8 in number) are the result of one or more attacks of acute rheumatic fever.

Apoplexy accounts for only five (5) per cent of our claims. As the policies carrying the disability feature grow older, it is not improbable that we shall have an increasing proportion of our claims due to this and other changes related to advancing years.

### REQUESTS FOR DISABILITY

Of some interest in connection with the study and handling of disability claims, are the number and character of requests received. During the past nine (9) months, we have had one hundred and thirty-two (132) requests under the disability clause. Of these fifty (50) or thirty-eight (38) per cent have been approved, and eighty-two (82) or sixty-two (62) per cent have been declined or action deferred. An analysis of cases submitted may be of interest.

#### DISABILITY REQUESTS

	Total	Approved	Declined or Deferred
Conditions resulting from accident	23	0	23
Disease of nervous system (1)	22	17	5
Tuberculosis	21	13	8
Acute infectious diseases and recent operations	14	0	14
Arthritis and rheumatism	13	3	10
Cardio-vascular-renal	10	7	3
Toxic goitre	6	2	4
Gastro-intestinal	5	1	4
Diabetes	3	1	2
Malignancy	3	3	0
Miscellaneous	12	3	9
	132	50	82

(1) Insanity 11 cases

Many of the requests, it may be noted, are based on temporary conditions, the result of minor accidents, acute infectious diseases, hospitalization and convalescence from surgical operations, etc. Toxic goitre is not an infrequent cause. Most of the claims have occurred under the total and permanent rather than the ninety day clause which we have been issuing during the past year. Under the present ninety day clause, not a few of the requests declined would have received favorable action. In eight cases of tuberculosis action was deferred until it could be determined that we were dealing with active cases.

#### MANAGEMENT OF CLAIMS

Our procedure in dealing with claims is no doubt similar to that of companies generally. With this in mind, I would merely call attention to a few phases of our claim work.

#### SPECIAL EXAMINATIONS

We experience considerable difficulty in getting reports from attending and local physicians sufficiently definite to portray the case. For this reason, we frequently have detailed examinations on prospective or existing claims made by skilled physicians or clinics at some distance, the Company paying all costs incident to the examination. The Company feels warranted in making the additional expenditure because of the greater certainty of action and the favorable impression left with the policyholder as a rule. We have

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found these special examinations most useful in checking up and discontinuing doubtful existing claims. The following is a case in point: A policy was issued in November, 1922. Claim was made one year later, allowed and continued for three years, with a diagnosis of pulmonary tuberculosis. The diagnosis was made at a Veteran's Hospital and confirmed at a second and third Veteran's Hospital one and two years later respectively. During all this time, he received \$100 or more per month from the Government. At the end of the three year period, a report was obtained after an exhaustive examination by Doctor M. of Portland, Oregon, showing an entirely normal individual with no evidence of past or present tuberculosis. Another case may be of interest. Request for disability benefits was made in 1924 under a policy issued six years earlier. The attending physician reported a mitral lesion with tachycardia following an attack of influenza. The case was referred to Dr. W. of Mason City, Iowa, who was given a free hand in determining the condition. A tentative diagnosis of hyperthyroidism with a functional heart murmur was made after seeing the policyholder several times, and the claim was allowed. The case was continued as a claim for three years, during which time three additional observations were made at intervals by Dr. W. The case was finally referred to the Mayo Clinic, where a diagnosis of cardiac neurosis and not hyperthyroidism was made. The claim was discontinued one year ago, and the claimant is apparently in good health at this time.

### MEDICAL TREATMENT OF CLAIMS

The wisdom of obtaining the best available examination for diagnoses of prospective and existing claims will probably not be questioned, but another procedure

resorted to by us in selected cases may not be generally endorsed. I refer to the company's assuming the burden of curative measures in the hope of effecting a cure and discontinuance of the claim. This has been resorted to in a number of claims, and I should add, without always attaining the desired results. In a large case, the victim of an exophthalmic goitre, we have paid the return transportation costs from the State of Washington to Rochester, Minnesota, as well as operative and other hospital costs. The case was continued as a claim for six months after the operation. The policyholder has been at work and well for the past year. The transportation and medical costs in the case were \$1,489.73 and the reserve released on discontinuing the claim was \$36,610.00.

A second case, a diabetic claim, was brought a considerable distance to Des Moines, and placed in one of our hospitals under the care of a capable internist. The carbohydrate tolerance was established, the insulin needs determined, and the patient instructed along proper lines during a period of three or four weeks in the hospital. The policyholder returned to his home deeply appreciative of the generous treatment accorded him by his company. He has received his monthly checks without fail during the past four years, the period since we undertook to cure him. The results were not just what we had expected.

A number of cases have been handled in this manner with varying degrees of success. In a selected and limited group of cases, the results justify the expenditure. I have in mind particularly surgical cases such as toxic goitre or gastric ulcer, which are prone to recur and disable for long periods when treated medically. One should bear in mind the possible unfavor-

able outcome of surgery and not urge any form of treatment to a point where the Company might be held responsible if the results are unsatisfactory.

#### COMPROMISE OF DISABILITY CLAIMS

There may be some difference of opinion as to the propriety of compromising disability claims. With a few specific cases in mind, the procedure would seem warranted under the following conditions:

(1) When misrepresentation or fraud in obtaining the policy is established and claim made under the clause during the contestable period.

A policy for \$25,000 with income disability and accidental death benefit was issued in June, 1925. Five months later, under rather unusual circumstances, the policyholder sustained a severe injury which necessitated the amputation of both feet. Under the clause, this constituted total and permanent disability, and the claim was promptly allowed. Within a few weeks of the accident, we learned that the claimant was receiving \$900.00 per month in disability payments, and that the bulk of his insurance had been secured within the year. Investigation disclosed that the claimant had secured two policies identical with our own during the month preceding our issue. In applying for the policy, the claimant denied having other disability insurance. The policy was taken up in lieu of lump sum settlement.

(2) Another type of case appears to justify a compromise settlement. I refer to a group of cases where there is an honest difference of opinion as to an existing claim within the meaning of the clause.

A policyholder, age thirty-seven and operating a farm, developed moderate varicosities of the veins of both legs. The policy provided \$75.00 per month of income disability. In the deflation period and following the issuance of the policy, the man lost heavily and was about to give up his farm. Claim was made, and resisted on the grounds that at the best the disability was only partial. The policyholder contended that he was wholly disabled from doing farm work, the only occupation he was equipped to follow. Suit was finally instituted, and the case settled out of court for a lump sum.

(3) A third group considered legitimate for compromise is the malingerer, or the type of case where experience has shown that a lump sum settlement is likely to effect a cure. Two cases of so-called sacro-iliac disease, in which a compromise has been effected, would probably fall into this group.

Case 1—Policy with disability providing a monthly income of \$50.00. A request for benefits was made in June, 1926, with a history of injury to lower spine three years earlier. The Mayo Clinic gave a guarded prognosis, considering the case one of "total temporary disability, with probable recovery at the end of three years." At one time, they considered an arthrodésis. The claim was approved, and six months later a compromise settlement effected. A report just obtained twenty months after settlement, discloses that the claimant is doing heavy manual work.

Case 2—Age forty-eight. The policy, providing an income of \$150.00 per month, was issued May 12th, 1921. Eight months later, the policyholder fell from a

ladder, causing a separation of the left sacro-iliac synchondrosis and a fracture of the coccyx. The claimant was sent to a nearby clinic for diagnosis and treatment, the Company bearing all costs. Because of the apparent slow progress made, the case was transferred and placed under the care of a well regarded orthopedic surgeon. The claimant was observed at intervals, and union of the sacro-iliac joint effected by means of body casts and braces. The surgeon gave a favorable prognosis, but the subjective symptoms and disability continued in spite of apparent healing of the parts. Disability payments were continued for about five years, at the end of which time a lump sum settlement was effected. A confidential report obtained ten months after settlement reveals no apparent change in claimant's condition. We shall be interested in observing the further progress of the case.

The problems connected with disability claim work are essentially medical. The establishing of the claimant's actual physical condition is necessary for the proper handling of the individual case. Without this, we grope in the dark and our action becomes uncertain and at times improper.

The various company clauses are essentially the same, our problems the same. Some uniformity in dealing with claims such as we strive to attain in selection of risks is desirable. No phase of our work is more difficult and unsatisfactory, and it is with this in view that the questions noted in the foregoing have been raised.

Dr. Daley—Gentlemen, I am sure we all thank Dr. Olsen for such a clever analysis of disability claims. He has brought a number of very important points out in his discussion.

Dr. Wells, will you kindly continue the discussion?

Dr. Wells—It has been with great pleasure that I have reviewed the paper on "Disability Benefits" presented by Dr. George P. Paul, and I feel that the essayist should be highly complimented for the work he has done. The paper contains, and is really a résumé of, all the generalities of disability underwriting, and they have been presented in a very clear, interesting and concise manner. Very little is left for discussion. As Dr. Paul's paper deals very largely with the practice of companies in the selection of risks for disability insurance, and as the company with which I am connected was probably not included by him in reciting these practices—it would seem that probably the best contribution I could make to a discussion of this paper, would be to tell of the practice of the Equitable Life of Iowa in regard to the many problems brought out by the essayist.

The matter of decision as to whether a total permanent disability exists is the hard problem. The sixty or ninety day clause of some companies has not helped materially in making that decision. In fact—it seems that it has taken from the Medical Department the necessity for making a decision—the question is "sidestepped." If the payment of disability benefits is once begun it is, in some cases, almost impossible to collect enough satisfactory proof to enable the company to stop these payments. We should, therefore, be much on guard in this first decision, providing the sixty or ninety day clause does not form part of our contract.

In Dr. Paul's paper he speaks of "Item Number One"—the question of the amount of disability income already in force at the time application is made.

There was a time when we did not consider it necessary to ask this question, because the disability income was limited, and to a certain extent still is, to what was considered to be a proper proportion of the amount of life insurance. If then, a man was not over insured in the amount of life protection, he could not very well be over insured in the matter of disability benefit. It seems to be sound theoretically, because, if a man needs say \$200,000 to insure his family a living somewhat commensurate with the manner accustomed to while the man is living, surely it would seem that the family would need the amount stipulated on the face of the policy each month in order to live in the same way while the breadwinner is totally and permanently disabled. This is, I believe, the theory underlying a disability income of \$10 on each \$1,000 of insurance.

The danger, however, would seem to lie in the cases where there is a large earning power, and when that power has been diminished as time goes on by economic changes, with the result that the disability income is much beyond the real earning power of the insured. When that time comes there is always the danger that the insured may have a sudden so-called nervous breakdown and be ordered by his physician to cease work. *We now* think this question very important and essential and giving information the underwriter should have. We pay no attention to cancellable health or accident insurance which we think has little bearing on total and permanent disability inasmuch as we do not operate under either the sixty or ninety day clause. We think we should limit the amount of disability issued by our own and other companies to an amount which will not seriously tempt the high salaried executive. We have put the amount at a

maximum of \$1,000 a month. If a man already has disability coverage income of that amount we deny the disability benefit although we may be willing to issue standard insurance on the life. Of course, our rejection does not prevent the applicant or broker from applying to other companies and possibly getting the amount applied for. We, however, feel that the rule is a good one—and follow it.

There is no doubt that a great many of our disability benefit troubles are due to over insurance. Now, if you agree with me in that diagnosis, we, as medical men, should find and apply a remedy. I believe that one way in which we could be helped materially would be in having the knowledge that the applicant had previously been limited for or refused disability coverage on account of over insurance. The details could be worked out by the M. I. B. Committee. Our troubles along the line of over insurance on disability are going to increase and cases will be handled by brokers in somewhat the same way as indicated in an article I recently saw in one of the Insurance Journals, which was in part as follows:

“Mr. Blank, one of the leading producers in new business on the west coast, has organized and will operate an Impaired Risk Service \* \* \*. According to a statement by Mr. Blank, the Bureau was formed to underwrite risks for agents and brokers which have been either excessively rated or rejected by various companies. \* \* \*”

This, to me, seems a very distinct hazard and we will certainly be forced to cope with this question with reference to disability coverage as well as with decided physical and medical impairments. I believe we should

all hesitate in accepting or even considering cases presented to us through such channels. These people have been rated, rejected or limited in life or disability coverage by some company with presumably good judgment. The information contained in the first report may never appear in subsequent ones. Brokers and some agents are insurance wise and know how to avoid giving unfavorable information. We are, of course, all liable to err in judgment—but at the best if such cases are accepted and policies issued we have only the risks upon which we have made the lowest bid—surely not a very good or profitable class.

In Dr. Paul's "Item Number Two," there is a suggestion that the applicant be asked relative to disability payments received in the past. This, I think, is usually an excellent idea. We have not been asking that question but have relied upon other sources to give us the information needed.

"Item Number Three" deals with the question as to whether our applications ask the actual income of the applicant. This question is also closely linked with over insurance. We ask this question on the back of the application which is answered by the agent. We do not believe that we have as yet reached the point where we can ask the question of the insured and have it form part of the contract. It is true, as Dr. Paul points out, that if an individual desires to insure his earning power he *should* be willing to tell us its approximate worth or the extent of his loss if he becomes totally and permanently disabled. Unfortunately it is often not so much the insured seeking disability coverage as it is the agent trying to sell it. For that reason we put the question to the agent. Strangely enough, the agent's estimate of the applicant's earned

income tallies fairly well with the inspection reports we receive. We always compare one with the other, and in questionable cases obtain special service or financial reports in addition.

We limit the disability coverage income to 60% of the applicant's earned income. We believe that is sufficient to prevent selection on the part of the insured when it is considered that our maximum limit is a total of \$1000 a month in all companies. Even with these limitations there is always a danger, possibly slight, of the applicant's income diminishing to a point where it is advisable to have a nervous breakdown. Certainly we have not had a claim where we have been party to the payment of a disability income to an insured who is drawing such income equal to several times the earned income in health. We have had one case, however, in which the income was slightly in excess of the earned income of the insured, but that happened because another company issued disability benefits in addition to what we had already granted. I do not know how we are ever going to solve this problem unless by the suggestion of Mr. Hutcheson—quoted by Dr. Paul—in which he says it may be necessary to include a provision in each company's policy to the effect that in the event of disablement, if the insured is covered by several policies, each company will pay only such proportion of the income insured as its policy bears to the aggregate disability income. I might remind you, as a matter of interest, that this suggestion has been made to the insurance companies by the insurance Superintendent of New York as late as the beginning of this year.

As we write no Non-medical insurance I feel that

I am not competent to discuss the question in Dr. Paul's "Item Number Five."

"Items Six and Seven" bring up the question of Occupational hazards. We do regard certain occupations as either more or less hazardous than the average in so far as disability is concerned, and do regulate our charge accordingly. I was much interested in what Dr. Paul had to say about this question, especially in those occupations that are considered to be favorable from a mortality standpoint. Our experience with farmers has been very unfavorable, so much so, that we at one time decided to charge them an extra premium for the disability benefit. Because, however, of pressure from our field force writing business in farming communities and the fact that no other company had adopted this practice, we were obliged to waive the extra charge. Nevertheless, we are still of the opinion that the farmer should pay for this extra disability hazard which is, in our case, very considerable, and we are not at all favorable to the viewpoint that the extra cost of disability coverage on farmers should be offset by the savings on mortality in the class. Farmers are poor disability risks, partly for the reason that the mental equipment of the average farmer is not such as to make him successful in other undertakings. If he cannot farm he does not work and we pay the claim. Because of that fact we are in reality issuing to them a disability benefit that is similar to the so-called professional disability benefit issued by one or two companies and for which they charge an extra premium. It would seem only fair, therefore, to the rest of our policyholders that the farmer pay for having a professional disability clause.

I was surprised to know that professional men ex-

perienced a higher disability rate than the average. Could Dr. Paul tell us whether his or some other company has had this unfavorable experience and the probable reason therefore? Women school teachers have been very poor disability risks insofar as our own experience is concerned. Our experience with women generally has been wholly unfavorable. We issue disability insurance to unmarried women only, and only those who are following a gainful occupation, and we further provide that the disability clause becomes null and void upon the insured's marriage. In spite of these restrictions, we have had a disability experience equal to about twice that among men—and for that reason we charge all women an extra premium.

Dr. Paul points out a number of physical impairments which should prevent the issue of the disability benefit. The practice he has outlined seems very similar to ours. We have tried in one or two particulars to make our practice a little more definite and our action more uniform by adopting the numerical rating system. We appreciate that the numerical rating applied to disability is very arbitrary and based upon no statistical evidence. We have, however, for some years now refused to grant disability to applicants underweight, or who have a personal or family history of Tuberculosis or Pleurisy, where the numerical rating for the combination of these impairments is 15 points or more.

Dr. Paul does not mention the number of disability claims the companies are receiving because of Nervous Instability. It seems to us that companies should guard themselves against this second largest cause of disability by either refusing or rating up the disability

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benefits where there is a family history of insanity. In my own company we charge extra for the disability where there is one case of insanity in the family. Where there are two or more the disability is declined. Suicide is considered to be equal to one-half case of insanity.

Impaired sight or hearing, deformities, loss of members by operation, are all frequently the cause for increased rating or the rejection of disability coverage.

Now, regarding our own disability report, this has been completed to September 30th, 1928. I hesitate somewhat to show the figures because of the small number of cases recorded, but, perhaps when placed with the reports of other of the smaller companies, the aggregate may serve to show the general trend. There is another reason for my hesitation, which is that the report is rather uncomplimentary to the Medical Director. His judgment must certainly be at fault for of the 451 cases approved by him as both totally and permanently disabled, 139—over 30%—have recovered to prove his error. I notice, however, that the other reports I have seen show practically the same state of affairs, and I am consequently somewhat encouraged.

TABLE I.

Status of Disability Claims on September 30, 1928  
By Cause of Disability (By Lives)

Cause of disability	Status of Claim			
	Existing	Recovered	Dead	Total
Tuberculosis	84	60	39	183
Nervous diseases not insanity	42	27	11	80
Insanity	33	10	8	51
General diseases	27	17	26	70
Accidents	15	11	2	28
Cardiac diseases	12	11	6	29
Miscellaneous	5	3	2	10
<b>Totals</b>	<b>218</b>	<b>139</b>	<b>94</b>	<b>451</b>

Table I shows that we have approved 451 claims for Total and Permanent disability. The most frequent cause was found to be Tuberculosis; 183, or about 40% of all cases, with 99 terminations, 60 of which were by recovery. There is some little excuse for this large per cent of recoveries in this class. We are very lenient with claims for disability from Tuberculosis, feeling that probably the payment of the small monthly benefit might assist in getting a more complete and rapid recovery or arrest.

Nervous diseases, not insanity, is second on the list with 80 approved cases, 27 recoveries and 11 deaths. Insanity—51 cases with 10 recoveries and 8 deaths. If we combine these last two classes under the heading of Nervous Instability, we would have a much more prominent second cause responsible for about 30% of our claims.

General Diseases—70 cases with 17 recoveries and 26 deaths.

Accidents—28 with 11 recoveries and 2 deaths.

Cardiac Diseases—29 with 11 recoveries and 6 deaths.

Miscellaneous—10 with 3 recoveries and 2 deaths.

We have a total of 218 existing claims upon which we are paying the disability benefit—a total of 139 recoveries and 94 deaths. This is certainly not a good showing as to decisions of permanency, but it does indicate that when a doubt exists the claimant is given the benefit of the doubt.

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TABLE II.

Status of Disability Claims on September 30, 1928  
By Year of Disability (By Lives)

Year of disability	Incurred	Existing	Recovered	Dead
1920	4	0	2	2
1921	14	1	8	5
1922	13	0	4	9
1923	34	5	21	8
1924	38	11	16	11
1925	58	23	24	11
1926	87	35	33	19
1927	121	73	28	20
1928 (9 months)	82	70	3	9
Totals	451	218	139	94

Table II is a record showing the year in which our claims were incurred and the status of these claims on September 30, 1928.

We have been writing disability benefits since 1916, but no claims were incurred in the first four years and we have but one existing claim incurred in the first seven years of our disability underwriting.

TABLE III.

Average Duration of Disability Claims which have been Terminated  
up to September 30, 1928.

No. of claims	Cause of disability	Years	Months	Days
98	Tuberculosis	1	2	17
38	Nervous disease not insanity	1	—	26
18	Insanity	—	11	3
42	General diseases	—	8	5
12	Accidents	1	9	9
17	Cardiac diseases	—	10	8
5	Miscellaneous	—	8	11
*230	Average duration	1	0	20

\* Three compromise claims not included.

Table III is a record of the average duration of our terminated claims in the various classes or cause groups. We were somewhat surprised to find the

average duration of terminated accident claims head the list. These show an average of 1 year 9 months and 9 days. The number in this group, however, is so small that we cannot take the showing seriously. Tuberculosis comes second as to duration, with 98 terminations showing an average duration of 1 year 2 months and 17 days. The combination of the two classes, Nervous Diseases not Insanity and Insanity, comes third with an average of 11 months 29 days. We had expected a longer average in these cases, and a shorter one in the Tuberculosis class.

The general average for all terminated claims was found to be 1 year 20 days.

The averages for the existing claims have not been figured.

These cases will, of course, increase our general average as time goes on, but the work is too recent to make any estimate of that increase. There has been a very rapid turnover in our disability claims, so that in all probability there will not be a very rapid increase in the averages shown.

In studying the ratio of Actual to Expected in our disability business, we find these figures:

TABLE IV.

Ratio Actual to Expected, to September 30, 1928.

Year	Per cent Actual to Expected	
	Incurred	Terminated
1926	230%	300%
1927	275%	250%
1928 (9 months)	225%	300%

In a report of our disability claims made up to September 30 of this year, according to Occupation, the following appeared:

TABLE V.

Status of Disability Claims by Cause and Occupation  
To September 30, 1928 (By Lives).

Cause of Disability Occupation	Tuber- culosis	Nervous In- sanity	Gen'l dis.	Acci- dents	Cardiac dis.	Misc.	Total	
{ Capitalists, Mgr's, { Supt's, and Props.	24	13	7	12	6	0	65	
Farmers	27	17	10	27	7	12	2	102
Professional men	17	5	3	4	0	2	1	32
Ministers and teachers	16	5	3	3	2	0	2	31
Skilled and unskilled workmen	31	14	11	9	8	8	2	83
Clerks in offices, stenos., etc.	28	13	5	7	2	5	0	60
Wholesale and retail clerks and salesmen	24	7	9	4	1	1	0	46
Miscellaneous	16	6	3	4	2	1	0	32
Total	183	80	51	70	28	29	10	451

Table V shows the status of incurred claims by occupation to September 30, 1928, by lives.

On all business issued by the company for the years 1920 to 1927 inclusive, approximately 15% was issued to Farmers, and 19% on the lives of Professional Men, including Ministers and Teachers. In computing the percentages of business in these two classes, the fact as to whether or not disability was issued is not considered. We cannot, from our records, at the present time give the percentages of disability issued in the various occupations. It should also be pointed out that the percentages on business issued are on policies. Other percentages and tables 'by lives'. It would hardly be right to assume that the issues of disability would have the same ratio as general business issued inasmuch as we decline or limit disability coverage in some occupations.

The Farmer heads this list in Table V in the proportion of claims approved—102, over 22%, of the 451 cases. The cause for most of these claims was not

accident, as expected, but Tuberculosis—26%, or 27 cases. Nervous Instability comes next—26%. Then General Diseases—26%. The Skilled and Unskilled Workmen were found to be second with the same general trend in causation.

Capitalists, Managers, Superintendents, and Proprietors were third with 65 cases, about 37% from Tuberculosis and 30% from Nervous Instability.

Clerks and Stenographers in Offices were fourth in frequency. In this group Tuberculosis was found to be the predominant cause—46%. Nervous Instability—30%. This class probably shows the influence of an indoor occupation.

Wholesale and Retail Salesman, Professional Men, Ministers, and Teachers, followed in the order named.

I believe that this report as well as the report of other companies indicates that we have in reality entered the field of the Health and Accident Companies.

There are many problems to be considered in connection with this continued underwriting of the disability benefit.

First—The compiling of satisfactory statistics to assist us in our proper consideration of the various factors of occupation, age, weight, family history, morals, and income.

Second—The improvement of means at our disposal to determine the degree of disability and the probability of its permanency. This would mean with other things the compiling of a list of dependable examiners and internists to assist in the work. The average examiner who can differentiate between a partial and a total disability, or between a temporary and permanent total disability, is the exception.

Third—Some way of obtaining more assistance from

our various reporting agencies in the way of reporting on the habits, morals, occupation, and income of the applicants.

Fourth—Some means of improving the co-operation between the various companies writing disability coverage, to the end that there might be more uniformity in our various decisions.

There will be many changes in our ideas and opinions for it can truthfully be said that we have made but a beginning in the writing of disability coverage.

Dr. Daley—Dr. Wehner, will you continue the discussion?

Dr. Wehner—The Fidelity staff is thoroughly in accord with Dr. Paul in his thought that medical men who seriously take up insurance work, soon realize they have entered a rapidly growing specialized field of medicine whose activities are many and varied and its problems great. The association of Disability Benefits with life insurance, particularly when claims result, frequently creates some of the most interesting and difficult situations we have to handle and the final solution of some of the factors presented as reasons or proofs for benefits being granted, are apt to occasion considerable destruction of gray matter. Why do the insuring public apply so urgently for Disability and Indemnity features? We quite agree with Dr. Paul that it is difficult to point to any one particular factor that is responsible for the increasing demand. There are many.

The newer forms of Disability coverage now issued are unquestionably a great sales-talk with agents, and as the associated privileges become more widely known, it is not surprising that the demand for them is rapidly growing. Again, the frequently published re-

ports of motor car accidents and deaths and the many hazards formerly carried by Health and Accident Companies, may be believed by many to be more economically covered. May it not be a fact that the present day interpretation of proofs submitted to the Claim Departments as evidence of disability, is so admittedly favorable to the insured in many instances (and we can rest assured the facts soon become widely known) that the minds of prospects become imbued with the idea that the Disability privileges are the important factors of a policy, and the life and maturity end of the contract secondary. If so, I believe that the sooner some generally uniform procedure, governing the granting of Disability and Indemnity is considered and put into general practice, the sooner and more adequately will these privileges be controlled so as to make them more subservient to insurance underwriting rather than tending to control it.

We have been requested, in discussing Dr. Paul's subject, to cover our Company's disability experience from certain types of nervous diseases. In proceeding along these lines our Actuarial and Medical Departments have made a careful investigation as to the Fidelity's Disability experience resulting from diseases of the nervous system. 143 claims of this type, under policies representing \$462,100 insurance, were received by the Fidelity Company during the years 1925, 1926 and 1927. In noting a summary of our findings I regret that our investigation in this particular class seems to yield so little of statistical value.

*Duration when disabled:* Permanent total disability, occurring within five years from issue of the insurance, represented 51% of these cases by number, or 61%

of the amount of insurance involved. While this is a high percentage of yearly claims, our actuaries do not believe the percentages are significant because most of our business which provides this coverage is less than five years old.

*Mode of termination:* Of the Disability claims covered, 64 policies, representing \$243,700 insurance, are still carried as Disability claims. 5 cases, for \$6,000 insurance, were terminated by completion of the Disability payments. In 29 policies, for \$100,600 insurance, the insured recovered, and 45 policies, representing \$111,800 insurance, were terminated by death.

*Age when disabled:* The Disability percentages, based on amount of insurance, occurred in the following age groups:

Male—Under age 30	18%
Ages 31 to 40	32%
" 41 to 50	34%
" 50 and up	16%

Female—Under age 30	9%
Ages 31 to 40	62%
Ages 41 to 50	16%
Ages over 50	13%

Here again the percentages may be very greatly affected by the distribution of our business. We do not have a large exposure at the older ages and will not have any considerable exposure in these groups for some years—until our policies and policyholders have become older.

*Average size of policy:* The average amounts of insurance of policies under these claims are as follows:

Male	\$3,285
Female	2,650

Evidently our Company has not been affected by any excess of either unusually large or unusually small cases.

*Duration of disability:* As 64 policies out of the total of 143 policies are still continuing in the totally disabled group, our experience is too incomplete in this respect to make deductions as to the average duration of total disability from our experience in diseases of the nervous system.

*Occupation:* The attached sheet gives a summary of the claims classified according to occupation. This tabulation also does not appear to show any striking features, certainly nothing that could be commented upon without knowing the corresponding exposure.

#### \* SPECIAL DISABILITY INVESTIGATION

##### Disability Caused by Diseases of Nervous System

Occupation—Male	No. of Lives	No. of Policies	Amount of Insurance
Farmers	14	14	\$40,500
Teachers	2	2	2,000
Office work (clerks, bookkeepers, accountants)	12	13	49,000
Advertising	3	3	9,000
Professional			
Physicians	5	8	41,000
Dentists	2	2	3,000
Attorneys	3	3	19,000
Musicians	1	1	5,000
Ministers and Clergymen	3	3	15,500
Pharmacists	1	3	10,000
Undertakers	3	3	10,000
Commercial Artists	1	1	2,000
Executives	14	19	87,500
Merchants (includes salesmen)	17	18	43,000
Mechanical Trades (plumber, bricklayer, carpenter, etc.)	12	15	21,700
Misc.	18	23	72,000
Female			
Teachers	2	2	8,800
Nurses	2	2	7,000
Housekeepers	1	1	2,000
Office work	6	6	9,000
Merchants	1	1	5,000

## SELECTION

My associate, Dr. Van Dervoort, in a contribution read before this Association in October, 1927, expressed our Company's views as to the care exercised in acting upon requests for Disability Benefits.

## SUMMARY

First, when an applicant applies for Disability Benefits, we still believe that great stress should be laid upon light weight under age 30.

Second, that women do not appear to be the best Disability risks. They show a higher ratio than men under disability claims caused by tuberculosis, kidney disease, arthritis and cancer, while men show a higher claim ratio than women from insanity and diseases of the arterial and digestive systems.

Third, that the amount of Disability coverage an applicant carries should be accurately stated on his application and additional coverage granted only when the sum total will be reasonably within his earned income.

Fourth, that earnest and increasing co-operation between the Insuring Companies in this respect is most desirable.

Fifth: It is submitted that as an applicant's family longevity is the greatest single factor at hand in assessing the value of a life risk, it is quite as important a factor in studying an applicant's qualifications for Disability and Indemnity coverage.

Dr. Daley—Thank you, Dr. Wehner. Is there any

further discussion on this subject? If not, I will ask Dr. Ferguson to make any remarks that he may care to make.

(Dr. Ferguson not present.)

Dr. Paul, will you kindly finish the discussion?

Dr. Paul—Mr. President and Members of the Association: May I first extend to you an expression of gratitude and appreciation for the honor and privilege of presenting a paper at this meeting. The original paper has nothing in it particularly novel or startling, but brings forth the present trend of income disability insurance as shown by the practices of 18 representative companies.

Income disability insurance has certain underlying basic principles. Among these may be mentioned medical selection, occupational classification, moral selection, the prevention of over-insurance and adequate premium rates and several others of minor importance. Of these the speaker feels that one of them should take more or less of an outstanding position. He refers to that of over-insurance, not so much because he thinks that it is the most important, but that it is important enough to merit our consideration. Appended to the paper are a few examples typical of this abuse of the income disability clause as attached to the life policy.

In a very recent report of an income disability committee, among other things it was stated that many Companies in the past have recognized the danger of over-insurance, but have felt that they were unable to obtain proper data and information as to the amount of disability coverage in force at the time of application. In a report of the Bureau of Personal Accident and Health Underwriters covering men's lives

over three or four years, it was said that the loss ratio should not exceed 55 per cent of the gross earned premiums and this does work very well in the policies and coverages of the smaller amounts, but when you get up to \$50 per week or \$200 per month coverage, then the experience was against the Company; in fact, instead of being 55 per cent, it reached 70 per cent, and in the very high coverages, 80 per cent.

It seems that some method of making available the information of all the Companies to those who need it and the amount of disability coverage in force would be very agreeable and very helpful.

I will not make any further use of figures, but may say that our figures so far as the order of the disability claims, impairment disability claims, goes, and the number or percentage of claims for the first, second, third and other policy years, is practically the same as that given by the doctors who discussed this paper. With farmers, we have the same experience as the other Companies, the experience is not so good. But with professional men we have had nothing out of the ordinary. In fact, it has been rather good. With women we have about, I should say, double the number of claims in proportion to those insured as of men. Such has already been stated by the representatives of other Companies.

Now if we could have repeatedly given to us such figures as have been given by the three men who discussed this paper, after a while we would have a foundation upon which we could work with reason in at least solving part of the problem of disability coverage and the granting of the same, and with these few remarks, gentlemen, I thank you.

Dr. Daley—Thank you, Doctor.

## Dublin—Overweight and Cancer 401

We are all familiar with the name of Louis I. Dublin. We all have benefited by the statistics obtained by him and sent out so generously by the Metropolitan Life Insurance Company. He has appeared and addressed our meetings before, to our benefit. It was largely through his activities here on the floor that our Medical Departments were saved from being discarded by the method of selecting applicants by the simple process of measuring a part of their shoulder blade. Dr. Knight felt that this paper should be brought before this Society and become part of its transactions. It was prepared at too late a time to allow a rearrangement of the program, but your President agreed with Dr. Knight and requested Dr. Dublin to present it to us. Dr. Dublin. (Applause.)

## THE RELATION BETWEEN OVERWEIGHT AND CANCER—A PRELIMINARY EXAMINATION OF EVIDENCE FROM INSURANCE STATISTICS

By LOUIS I. DUBLIN, Ph.D.

*Statistician Metropolitan Life Insurance Company*

The possibility that a close relation exists between overweight and cancer is not a new thought. The suggestion is widely scattered in medical literature but no very serious attempt has been made up to the present to investigate this approach to the cancer problem. Empirical observation of medical men, both clinicians and surgeons, together with recent studies in the physiology and chemistry of the cancer cell have brought this question to the fore. I hope that as a result of this discussion, a new impetus may be given to cancer research in this direction.

Statistics from three different insurance sources are presented herewith which throw light on the relation between overweight and cancer. The first source of information from insurance data is one familiar to all the members of the Association, for it is no other than the Medico-Actuarial Mortality Investigation. An analysis of the principal causes of death by age groups at issue was made as part of the routine of the investigation and is to be found in Volume II, page 34, of the published report. This analysis shows that men accepted for insurance between the ages 30 and 44 and who were 50 pounds or more overweight at issue, show a subsequent mortality from cancer of

37 per 100,000. Persons who were in the group of "standard" lives, which includes all those less than 50 pounds overweight down to those who are not more than 24 pounds underweight, show a subsequent mortality rate from cancer of 32 per 100,000; and those underweight, 25 pounds or more, had a mortality rate from this cause of only 24 per 100,000. In like manner, persons who were 45 years of age or over at the time of insurance and who were then 50 pounds or more overweight had a mortality rate of 156 per 100,000 from cancer compared with 144 per 100,000 for "standard" lives and 120 per 100,000 for persons in the underweight group. In other words, in the younger group, we find subsequent mortality rates among the overweights 15 per cent in excess of that among "standard" lives and 50 per cent in excess of that among underweights. Among the men who were 45 and over at issue, the subsequent cancer mortality rate of overweights is 8 per cent in excess of that of "standard" lives and 30 per cent in excess of that of underweights.

It is worthwhile at this point to note similar facts as regards diabetes, a disease in which we know that the metabolic efficiency of the body is seriously impaired. In the group who were between ages 30 and 44 at the time of application for insurance, 59 per 100,000 of the overweight men subsequently died of diabetes, compared with 12 per 100,000 among "standard" lives and 5 per 100,000 among underweights. Of men 45 years of age or more at the time they were accepted for insurance, overweight men show a subsequent mortality rate from this cause of 136 per 100,000, compared with 28 per 100,000 among "standard" lives and 6 per 100,000 among underweights.

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Although the differences between the several weight groups from this cause are greater than in the case of the cancer death rates, there is certainly a striking parallelism between the two.

The facts regarding the death rates from cancer and diabetes by build class contained in the Medico-Actuarial Investigation, are presented in Table 1.

TABLE 1.

Deaths per 100,000 from Cancer and Diabetes  
Medico-Actuarial Mortality Investigation—1885 to 1908.

By Ages and Build Class at Issue.

Build class	Death Rates per 100,000			
	Cancer		Diabetes	
	Ages at Issue	Ages at Issue	Ages at Issue	Ages at Issue
	30 to 44	45 and over	30 to 44	45 and over
Underweight (25 pounds or more below average weight)	24	120	5	6
Standard weight	32	144	12	28
Overweight (50 pounds or more above average weight)	37	156	59	136
Percentage, rate for overweights of rate for standard weights	115.6	108.3	491.7	485.7

The second important source of evidence based on insurance data consists of the records of the Union Central Life Insurance Company which were used by the Association's "Committee on Dreyer Measurements in Relation to Life Insurance Underwriting Practice." It will be recalled that these records contain full data on the build of applicants. Through the kindness of Dr. William Muhlberg, Medical Director of the Company and Mr. E. E. Hardeastle, Actuary of the Company, we are able to present the results of an analysis of death rates in this experience by build

class. In obtaining our results, we have made allowance for differences in age distribution between the several weight classes.

In brief, our results show an increasing mortality from cancer with increasing weight. Thus the highest mortality rate from cancer is found in the group 25 per cent or more overweight, namely, 143 per 100,000. The group 15 to 25 per cent overweight have a death rate of 138 per 100,000; those 5 to 15 per cent overweight, 121 per 100,000; men of normal weight,—those whose weight is less than 5 per cent over or under average weight,—111 per 100,000; those 5 to 15 per cent underweight, 114 per 100,000; and those 15 per cent or more underweight, 95 per 100,000. Expressed on the percentage basis and taking the mortality of the normal weight group as 100 per cent, we find an excess mortality of 9 per cent in those less than 15 per cent overweight and an excess of 25 per cent in those 15 per cent or more overweight. The group who are less than 15 per cent underweight show a mortality somewhat higher than the normal weight group, but it is still much less than the group who are slightly overweight, but, on the other hand, those who are more or less seriously underweight have a death rate from this cause of 14 per cent less than the normal weights.

The facts brought out by the Union Central experience are shown in Table 2.

TABLE 2.

Deaths per 100,000 from Cancer—All Forms—At Ages 45 and Over  
by Build Classes among White Males in Experience of Union  
Central Life Insurance Company, 1887 to 1921.

Build class at issue of policy	Death rates per 100,000*	Percentage of rate in "Normal" Weight Class
15 to 50% underweight	95	86
5 to 15% underweight	114	103
Normal weight	111	100
5 to 15% overweight	121	109
15 to 25% overweight	138	124
25% or more overweight	143	129

\* In a population with age composition of the normal weights.  
First four policy years excluded to reduce effect of medical selection  
of applicants for insurance.

Our third approach to the problem of establishing a relation between cancer and overweight consisted in classifying a sample of deaths from cancer on the one hand, and deaths from accidents on the other, among insured lives, according to their weight at the time of issue of their policies. Deaths from accidents might be looked upon as a control group showing how the general population is distributed with regard to weight. For this purpose, we were able to use the death claims of the Ordinary Department of the Metropolitan Life Insurance Company for the year 1927.

Our analysis showed that among white males, for whom we had the most adequate data, there was no essential difference at ages under 45, as regards distribution by weight classes, between cancer and accidents, but that in the age period 45 to 64, those who were average weight or more, comprised 55 per cent of the total among those dying from cancer, whereas only 48 per cent of those killed in accidents were in this weight group. At the older ages, namely, 65 and over, the difference is even greater; 51 per cent of

those dying from cancer were average weight or more as against only 43 per cent of those killed in accidents. In both age groups 45 and over, the relative number of those excessively overweight—20 per cent or more—is nearly 25 per cent greater among those dying from cancer than among those dying from accidents.

Unfortunately the number of deaths on which this analysis is based does not permit us to go into detail, but indications are that much of the excess mortality is due to high death rates among overweight men from cancer of the digestive system and among women from cancer of the digestive system and of the female genital organs. It would appear, therefore, that even this rough analysis confirms what we have already found in the general mortality experience, namely, that those who are overweight are more likely to die of cancer than those who are not; and possibly, of certain types of cancer rather than other types.

To sum up then, our statistical evidence of a possible relation between overweight and cancer is supported by three separate sources. The facts brought out by them are of such importance as to merit a thorough examination of the subject, considered particularly in relation to the remarkable parallelism demonstrated between death rates from cancer and diabetes and in relation to the growing body of apparently confirmatory data based on clinical, biochemical and biological researches.

It is probably not unreasonable to assume from the evidence that metabolic imbalance, both in the body as a whole and in the malignant tissue itself, plays an important role in the causation and development of cancer. Our ignorance of the factors underlying these phenomena is altogether so deep

that a clue which seems so fruitful as the proposed approach to the cancer problem, ought to be seriously followed up. The social responsibility of life insurance companies in regard to this problem is so great that they should not fail to do their part in its eventual solution. The members of this Association are in a peculiarly advantageous position to help, for they have at their disposal numerous records of life insurance examinations in which are contained data, such as build, weight, urinary impairments, etc., at the time of the application, which are likely to be of great value after analysis in discovering factors underlying cancer. It is to be hoped that this paper will encourage the members of the Association to look further into this matter, to pool their resources and to thoroughly survey the facts regarding cancer which insurance data may reveal.

Dr. Daley—I presume everybody is aware of the fact that we have more deaths from cancer than any other cause except Circulatory Diseases. I think we might very well, indeed, take this thought which Dr. Dublin has given us and think about it very seriously. Fortunately, this Association has provided, by approving the motion of Dr. Rogers, the setting up of machinery for this purpose.

Dr. Muhlberg.

Dr. Muhlberg—Mr. President and gentlemen: I am again in a very embarrassing position. I am asked to discuss Dr. Dublin's paper and I have not had the opportunity of reading the doctor's paper. All that I saw was a report in the *Metropolitan Bulletin*, published I think some two or three months ago.

His research excited my interest for two reasons. In the first place I was very much disappointed some

years ago when the study of the material by Dr. Dublin on the relation of stem length to overweight showed such meager results. I think we were all disappointed and were all prepared to hear that overweights with long spines were better risks than those with short spines, but unfortunately, we couldn't prove it.

Now Dr. Dublin has, I think, dug out of those statistics something that is of real value. There seems to be some relationship between overweights and cancer and sugar metabolism. His figures show quite conclusively that cancer is commoner among overweights, just as of course, diabetes is commoner among overweights. I have been in communication with Dr. Jackson, of San Antonio, and I promised him some two or three months ago that I would make an investigation of those of our policyholders who had submitted samples to the Union Central and in whom we had found traces of sugar, with an idea of making an investigation to ascertain whether cancer occurred more frequently amongst them. We have some six thousand of these cases.

But there is another phase that is interesting, the chemical phase, and I think that ought to be stressed. Muscle is very peculiar in its metabolism, so far as sugar is concerned. Dr. Dublin mentioned that, but perhaps didn't stress it. You know glycogen is stored in muscle and when muscle performs any work, it uses its glycogen, breaking it down into lactic acid, but it doesn't carry it any further than the lactic acid stage. Just why, we don't know, but it extracts energy by changing glucose into lactic acid and then when the muscle rests, it builds up the lactic acid into glycogen, apparently by burning up some of the glucose. That is very peculiar behavior, but in can-

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cer, which also consumes sugar, lactic acid is not formed in any large quantity but the dextrose molecule is burned down almost entirely to carbon dioxide, a much smaller quantity of lactic acid being formed. It is significant that this is what occurs in embryonic tissue. Embryonic tissue is like the cancer cell in that it is very destructive in handling glucose. You will remember the old Cohnheim theory of embryonal remains. I think that theory has been discarded, but it seems probable that when tissue cells become cancerous, they revert back to embryonic tissue. So cancer cells behave very much like embryonic cells, but instead of showing orderly growth, they show the disorderly growth, which is characteristic of cancer.

Now personally, I don't feel that the evidence is strong enough to indicate that a hyperglycemia, increased quantity of sugar in the blood, will start a cancer, nor is the cause of cancer, but I have no doubt at all that an increased amount of sugar in the blood will promote the growth of cancer, stimulate cancer and it is quite possible in the hopeless cancer cases, where an operation is out of the question, that the life of the patient may be prolonged by restricting the carbohydrate diet and by attempting to produce a condition of hypoglycemia, a lessened quantity of sugar in the blood. Further evidence in favor of this view appeared in the paper of Dr. Bradshaw and Dr. Carber. They investigated the mortality among those showing intermittent glycosuria and their figures showed that persons giving a history of intermittent glycosuria had a cancer rate of 50 per cent above the normal.

The real situation is this: We know so little about cancer that every fact that can be contributed that

will have a tendency to throw light upon the etiology of the disease will be welcomed by those who are interested in cancer research. Professor Haldane, who is perhaps one of the shrewdest logicians and physiologists of our times, feels that a further investigation of the relationship of cancer and carbohydrate metabolism may possibly give us the clue that will eventually result in solving the cancer problem.

I thank you. (Applause.)

Dr. Daley—The subject is open for general discussion. It is to be regretted that we could not have had the benefit of this paper before so as to digest it a little bit, but if there is any question that comes up in the minds of anyone present, it is his obligation to this Association to present it.

There is one question which has come up in my mind on this subject. Many overweights are people who present a certain amount of what I might call, for want of a better phrase, a dyscrasia of endocrine origin. Quite possibly the condition that produces this overweight which is generally characterized by an irregular distribution of fat might also produce the condition as regards the splitting up of glucose as described by Drs. Dublin and Muhlberg.

Isn't there someone else who has got something to say on this subject? If not, I am going to ask Dr. Dublin to close the discussion.

Dr. Dublin—I have nothing further to say.

Dr. Daley—Thank you, Dr. Dublin, for a very interesting paper. There has been one paper presented in this preliminary fasciculus by Drs. Rogers and Hunter which has not been discussed, nor has Dr. Rogers spoken to us about it and I have not had a chance to get hold of him for this purpose, but I am sure that they presented it, as they always do for the benefit of this Association. The paper speaks for itself.

## MORTALITY STUDY OF IMPAIRED LIVES.

No. 7

- (a) Renal Colic, Calculus or Gravel
- (b) Biliary Colic or Gall Stones

By

OSCAR H. ROGERS, M. D.

*Chief Medical Director*

and

ARTHUR HUNTER, LL. D.

*Second Vice President and Chief Actuary, New  
York Life*

These two colics have no other connection than that they are both colics. Renal colic has to do with the formation of concretions in the pelvis of the kidney, along the ureter, or in the urinary bladder. It is sometimes referred to simply as calculus or gravel. Biliary colic has to do with an inflammatory process, or the formation of calculus in the gall bladder or in the ducts connected with it. Gall stones are formed in the gall bladder or the bile ducts and are often called biliary calculi.

We are therefore not dealing with a single pathological condition but with at least two distinct ones. In making a study of these impairments in a single paper we are following the classic example of Dr. Symonds, who in 1908, presented a study of these conditions before the Medical Directors Association. His work on these subjects had, however, been pre-

ceded by the "Specialized Mortality Investigation," which in 1903 gave us in classes #52 and #53 the experience of 34 Companies with renal and hepatic colic. Later the Medico-Actuarial Committee furnished us in classes #12 and #24 with the experience of the associated companies. In none of these studies of colic was any attempt made to determine whether there had been any operative interference. In the Medico-Actuarial investigation a distinction was made between gravel and renal colic or calculus which indicated that for life insurance purposes there was no difference between them.

This is an endeavor to determine the mortality with respect to the number of attacks, the time elapsed since the attack, dealing separately with those in which there has been an operation. In order to obtain as much material as possible, the experience of our Company has been analyzed for the issues 1896 to 1926 inclusive, carried to the anniversaries in 1927. The expected deaths have been calculated according to the Company's experience on standard lives during that period. This has been about 97% of the A. M. Select Table and, in reading our results, a deduction of 3% from the mortality ratios given in our tables will convert them to ratios in terms of the A. M. Select Table.

The present investigation was made both by policies and by amounts insured but, as the volume of the material was too small to prevent substantial fluctuations in various classes when studied by amounts, we are giving, with a single exception, the results by policies only. All of the risks were insured on substandard plans by advancing the age, by charging an extra premium or by some other recognized method.

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In making any comparison with our results it must be remembered that the risks included in the Medico-Actuarial investigation were insured on standard plans while those of the New York Life were accepted on substandard plans. The former had probably a smaller percentage of cases which had been operated upon than the latter and a distinctly lower proportion of cases which had experienced two or more attacks.

**RENAL COLIC, CALCULUS, GRAVEL**

We have divided our experience into cases with operation, and those without operation, subdividing wherever practicable, according to number of attacks and the time elapsed since the last attack. In the first table we shall deal with policyholders who did not have an operation for renal colic, calculus or gravel prior to application for insurance. Following the ratio of actual to expected deaths appears the probable deviation or error, a description of which appears on the first two pages of #6 of our "Mortality Study of Impaired Lives."

RENAL COLIC, CALCULUS, GRAVEL

WITHOUT OPERATION

Time elapsed between attack and appli- cation for insurance	Number of cases	Actual Deaths	Standard	Expected Deaths by Company's		Ratio of Actual to Expected Deaths
				and	Ratio of Actual to Expected Deaths	
<b>One Attack</b>						
Within two years	813	40	38.4	104%	± 11%	
More than two years prior	538	42	41.3	102	± 10	
At any time*	1,351	82	79.7	103	± 7	
	==	==	==	==	==	==
<b>Two or more at- tacks</b>						
Within two years	437	32	23.5	136%	± 14	
More than two years prior	407	44	30.0	146	± 12	
At any time	844	76	53.5	142	± 9	
	==	==	==	==	==	==
<b>Total</b>	<b>2,195</b>	<b>158</b>	<b>133.2</b>	<b>119%</b>	<b>± 6%</b>	
	==	==	==	==	==	==

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We should naturally expect that the mortality would be higher among those in which the attack was most recent. In the M. A. M. I, the ratio of actual to expected deaths was lower among persons who had had an attack within two years of application for insurance than those between two and ten years prior to such application. In the present material there is no evidence that the more recent the attack the higher the mortality. While differences in the mortality ratios may be expected by reason of accidental fluctuations the reason for these results probably lies in the very careful selection by the companies of cases with a recent attack. On the whole, the significant feature of the foregoing table is the high mortality of those who had had two or more attacks.

In order to determine whether the duration of the insurance or the age at issue had any effect on the mortality, the following table was prepared:

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### RENAL COLIC, CALCULUS, GRAVEL

#### WITHOUT OPERATION

	Actual Deaths	Expected Deaths by Company's Standard	Ratio of Actual to Expected Deaths
<b>One Attack</b>			
1st five policy years	30	24.4	122% $\pm$ 13%
6th & succeeding policy years	52	55.3	94 $\pm$ 9
<b>Two or more attacks</b>			
1st five policy years	24	17.2	139 $\pm$ 16
6th & succeeding policy years	52	36.3	143 $\pm$ 11
<b>Total</b>	<b>158</b>	<b>133.2</b>	<b>119 <math>\pm</math> 6%</b>
<b>One Attack</b>			
Ages at issue 15-39	36	31.7	113% $\pm$ 12%
“ “ “ 40 & older	46	48.0	96 $\pm$ 10
<b>Two or more attacks</b>			
Ages at issue 15-39	37	17.5	212 $\pm$ 16
“ “ “ 40 & older	39	36.0	108 $\pm$ 11
<b>Total</b>	<b>158</b>	<b>133.2</b>	<b>119 <math>\pm</math> 6%</b>

While there was apparently a higher mortality in the early policy years in the case of one attack the same tendency did not appear in the case of two or more attacks.

A curious feature is the markedly higher mortality

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at the earlier ages in the case of two attacks. Theoretically, there seems no reason for this result. In all the recent studies of renal colic, however, there has been a tendency toward a lower relative mortality at the older ages at entry. This marks a change from the findings of the Specialized Investigation and of Dr. Symonds' small group of "standard" cases. It may be a result of the more severe selection exercised among entrants at the older ages.

The cases of one attack of Renal Colic, Calculus or Gravel, without operation were separated into three build groups as follows:

### RENAL COLIC, CALCULUS, GRAVEL

#### WITHOUT OPERATION

	Number of Cases	Deaths by Deaths	Ratio of Actual to Ex- pected Deaths	Expected Deaths
24% underweight to				
5% underweight, incl.	517	32	31.4	102% $\pm$ 12%
4% underweight to				
4% overweight, incl.	344	27	25.0	108% $\pm$ 13%
5% overweight to 24% overweight, incl.	449	22	20.0	110 $\pm$ 15%

The death rate increases with weight but it is doubtful whether this increase is out of proportion to the natural increase due to that element without regard to the renal colic. This table, of course, does not give a complete picture of the effect of combining overweight with a history of renal colic for the reason that all cases substandard by reason of "build" have been excluded from our material.

## RENAL COLIC, CALCULUS, GRAVEL

## WITH OPERATION

The amount of material in this group was less than one-third of that without operation, as follows:

	Number of Policies and Amount Insured	Actual Deaths	Expected Deaths by Company's Standard	Ratio of Actual to Expected Deaths
Policies	635	36	22.0	164% $\pm$ 14%
Amounts	\$2,303,200	\$144,800	\$72,500	200 $\pm$ 14

Dividing the experience according to duration of insurance there is no material difference in the relative mortality. So far as concerns age at issue, however, there is a distinctly lower mortality for ages at issue 15 to 39 than for ages 40 and over. While the statistics are comparatively few in number the same tendency is noted both by policies and by amounts of insurance. There were 11 deaths at ages of issue 15 to 39, and 25 at ages 40 and over, with relative mortalities of 115% and 202% respectively of the Company's Standard table. The corresponding mortality at these two groups of ages at issue was 102% and 265% by amounts insured. This suggests that the Company may have been too lenient in accepting applicants at the older ages which had undergone an operation for renal colic.

The principal cause of death in all of these studies of Renal Colic was Bright's disease, with 16% of the total (30 deaths) against an expected proportion of 3% to 5%. The next most important cause of death among the not operated was heart disease with 13% (20 deaths) and among the operated cases, cancer with 17% (6 deaths).

At this point it may be useful to emphasize the similarity between our mortality, combining the cases with and without operation (all accepted as sub-standard) and the mortality of the M. A. M. I. under renal colic or calculus.

## RENAL COLIC, CALCULUS, GRAVEL

## WITH OR WITHOUT OPERATION

Issue	New York Life	M. A. M. I.
	Ratio to Expected by Company's Standard	Ratio to Expected by M. A. Select
<b>One Attack</b>		
Under age 40	119% $\pm$ 11%	117% $\pm$ 7%
Age 40 and over	110 $\pm$ 9	106 $\pm$ 4
<b>Two or more attacks</b>		
Under age 40	188% $\pm$ 15%	170% $\pm$ 22%
Age 40 and over	119 $\pm$ 11	102 $\pm$ 11

The mortality ratios correspond very closely. The salient feature is the unfavorable experience under those lives which at the younger ages have had at least two attacks of renal colic or calculus.

From the foregoing synopses it does not appear that a single attack of renal colic, without operation, is of serious moment, but for a year or two after the attack the company had exercised great care in selection and accordingly the assumption should not be made that persons with a recent attack are standard risks.

Our studies seem to show that the mortality among cases which have undergone operation is higher than under those without operation. With respect to the mortality by ages of issue we have an apparent contradiction between cases without operation and those operated upon. It will be remembered that our statistics covering one attack without operation show a slightly higher mortality at the younger than at the older ages, and a very much higher mortality with two

attacks. When we deal with persons who have had an operation the material is not sufficiently large to justify us in making a subdivision according to one or more attacks, and even combining all cases the data are not conclusive. Taking such material for what it is worth we find a markedly higher mortality at the older than at the younger ages. This apparent contradiction may be solely due to the difference in medical selection, or to the fact that persons who have had one or more attacks and on whom it has been necessary to operate represent a graver type of the impairment. It is such results as these which make investigators hesitate to publish their findings, but it seems advisable to give them in order to assist other seekers after knowledge.

#### BILIARY COLIC OR GALL STONES

Our entire material on biliary colic or gall stones covered only 1,117 cases, with 70 deaths. While the mortality experienced by the company in this group was only slightly above the Company's standard mortality table, wrong conclusions may be drawn therefrom as the cases range from a single attack of biliary colic more than two years ago to an operation for gall stones after two or more attacks. Instead, therefore of giving the figures for the various groups, which are necessarily small, we are merely stating the results, with the caution that a group may have as few as eight expected deaths.

*Biliary Colic*—One attack without operation. The mortality was not higher than that for standard risks.

*Gall Stones*—One attack at any time prior to application without operation. The mortality was normal.

*Biliary Colic or Gall Stones*—One attack within two years of application, operation performed. The mortality was high, more than twice the normal.

One attack two or more years before application, followed by operation. The mortality was normal.

Two or more attacks at any time, either with or without operation. The mortality was distinctly high (50%) in the early policy years, and normal after that time.

As in the M. A. M. I. the death rate from heart disease and Bright's disease was distinctly above normal. Nine per cent of the deaths were from gall stones or intestinal obstruction. The death rate from cancer was normal. We mention this because Dr. Mayo in an experience presented to the Medical Directors Association in 1916 had found a large proportion of deaths from cancer.

It is worth while pointing out the great improvement in our knowledge of biliary colic which will follow the use of the new code for recording medical impairments. The companies now have seven classifications which correspond to only one in the M. A. M. I. There are three classes under gall stones—no operation, removal of gall bladder and drainage of gall bladder; the same three divisions under infected gall bladder; and also a seventh code number for any biliary colic not clearly defined elsewhere.

In view of the proposed new collective investigation into medical impairments and the comparatively small amounts of available data at present we hesitate to make recommendations with regard to the insurance of cases with a history of biliary colic. So far we have had practically no cases defined as infected gall-bladder, and only comparatively few cases defined as gall stones;

these were nearly all without operation. Hence about half of our material was of the type not clearly allocated to any of the six regular classes of the new code.

In conclusion it may be said that more serious cases of biliary colic appear to be those operated upon, and that the mortality among these is distinctly high in the years immediately following operation. If, however, two full years have elapsed since operation, the mortality seems to be no greater than among cases which have not undergone operation, but we do not recommend such liberal treatment as our experience indicates until more material is available.

Dr. Daley: There are a number of pamphlets here. That one of Dr. Knight's is especially good. If the members would like to take two or three or more copies home for the benefit of their colleagues who were not able to come, we should be very glad to have them do so.

In turning over this gavel to my successor, Dr. Patton, I wish to congratulate this Association upon his selection by them as President. I wish to thank you as members of this Association for your attendance here. I wish particularly to thank those who have contributed to whatever success this meeting may have been by their presentation of papers or their taking part in the discussion. I hope that you all have received some benefit from your attendance and that you will be able to apply it not alone for the benefit of your own Company but for the advancement of the best interests of life insurance in general.

I wish to assure Dr. Patton of the whole-hearted support of this Association during his presidency. I thank you, gentlemen. (Applause.)

Dr. Patton—Members of the Association: I am very deeply appreciative of the honor that has been passed on to me. I only hope that I can, in a small measure, measure up to some of the standards and some of the marks that have been set by my predecessors, especially my immediate predecessor. I know of no meeting in almost twenty years of my attendance that has had two such high points as this meeting, glycosuria yesterday and heart condition today. I know of nothing that has troubled us in our office in the selection game as the glycosuria has in the past few years. We need more light than we have had, and judging from the discussion of yesterday, we are well on the way to receive more light. The discussion we had today on the heart shows that we are certainly on the way to understand the real trouble with the heart. Heart murmur has not been the real trouble for us. It has been the outstanding thing found on the ordinary examination. Methods of measuring what really is the trouble with the heart from not only the life insurance standpoint but the community in general are the things that we need.

If I can receive, and I have every reason to feel that I have the cordial support of the Association that has been given in the past, I have no doubt but what we will be able to bring out additional facts and factors that will be of value in the life insurance work in this country and therefore to the entire population of the country.

I am very glad indeed of one thing recommended by the Council and approved by the Association, and that was to suggest a committee on programs. I have realized from what I have seen of the previous arrangement or programs the burden the President

of the Association has had to carry in this respect, and although I have considered that the President, who has so recently gone through that, needs relief, I have gone to Dr. Daley and have obtained his consent to act for another year as a member of that committee. We need his experience and am thankful to say we are going to have it. Dr. Muhlberg, one of the other members of that committee, authorized by the adoption of the motion the other day that the President and Vice President be on that committee and two others to be selected, Dr. Muhlberg couldn't escape. We have prevailed upon Dr. Ross Huston as the fourth member, and we hope to get arrangements for a program started so that we can have the finished papers on hand for the entire program so that each member of the Association can have that in his possession in sufficient time prior to our meeting, to review it, and they can come here prepared to more thoroughly digest things than if they have not had an opportunity to read or to study them prior to the meeting.

It is possible, quite probable, that the meeting next year may be held in Newark, the Home Office City of The Prudential, and we will do our very best to entertain you in every way that we can, though we realize the difficulty of reaching the grade or height of entertainment and care than can be given to a meeting of this kind in a city like New York.

Dr. Ward—May I present a resolution, not as a mere formality, but I am sure that I voice the sentiment of every one who is before me. Those who have served in the capacity of President of this Association and have been thus honored have some appreciation of the amount of time and labor that

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is involved in preparing a program such as has been prepared for us this time, and as Dr. Patton has already said, in the long history of the Association, I doubt if there has been a superior program and very few that have equalled this. So, as I say, in presenting this resolution, it is not a formality, but it is a real, sincere expression of our appreciation:

This Association desires to record its appreciation to the Officers of the Equitable Life Assurance Society for their most generous hospitality.

We also desire to express to Dr. Robert M. Daley, the retiring President, our sincere thanks for his most valuable service to our Association. He has provided for us a program of exceptional merit and has made possible one of the most constructive conventions that we have ever held.

Mr. President, I move the adoption of this resolution.

(Motion was seconded.)

Dr. Patton—It has been moved and seconded to say that the sincere thanks of this Association be given to the Equitable Life Assurance Society and to Dr. Daley, our retiring President, for the very pleasant and instructive meeting that we have had. I call for a rising vote on that.

(Unanimously carried.)

Dr. Daley—Thank you.

Dr. Patton—Is there anything further to be brought out? If not, the meeting will stand adjourned.

LIST OF MEMBERS OF THE ASSOCIATION OF  
LIFE INSURANCE MEDICAL DIRECTORS

Frederick R. Abbe, M. D.	Columbian National, Boston, Mass.
John L. Adams, M. D.	Metropolitan, New York.
Edwin H. Allen, M. D.	John Hancock, Boston, Mass.
G. E. Allen, M. D.	National Life, Mont- pelier, Vt.
Charles D. Alton, M. D.	Connecticut Mutual, Hartford, Conn.
Harry B. Anderson, M. D.	Imperial Assurance, Toronto, Ont.
Thomas D. Archibald, M. D.	North American, To- ronto, Ont.
Edward McP. Armstrong, M. D.	Mutual Life, New York City.
William B. Aten, M. D.	Security Mutual, Bing- hamton, N. Y.
Malcolm O. Austin, M. D.	West Coast, San Fran- cisco, Calif.
Albert E. Awde, M. D.	Union Mutual Life, Portland, Maine.
Walter C. Bailey, M. D.	New England Mutual, Boston, Mass.
Henry A. Baker, M. D.	Kansas City Life, Kan- sas City, Mo.
Henry A. Bancel, M. D.	Mutual Life, New York City.
G. Holbrook Barber, M. D.	Manhattan Life, New York City.

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Norman J. Barker, M. D.	Connecticut General, Hartford, Conn.
William B. Bartlett, M. D.	John Hancock, Boston, Mass.
John T. J. Battle, M. D.	Jefferson Standard, Greensboro, S. C.
Wesley W. Beckett, M. D.	Pacific Mutual, Los Angeles, Calif.
Edgar W. Beckwith, M. D.	Equitable Life, New York City.
Roland A. Behrman, M. D.	John Hancock, Boston, Mass.
Maurice B. Bender, M. D.	Guardian Life, New York City.
Charles D. Bennett, M. D.	Mutual Benefit, New- ark, N. J.
Thomas W. Bickerton, M. D.	New York Life, New York City.
Edward B. Bigelow, M. D.	State Mutual, Worcester, Mass.
Cecil C. Birchard, M. B.	Sun Life, Montreal, Quebec.
Arthur B. Bisbee, M. D.	National Life, Mont- pelier, Vt.
Wilton F. Blackford, M. D.	Commonwealth Life, Louisville, Ky.
David N. Blakely, M. D.	New England Mutual, Boston, Mass.
Earl C. Bonnett, M. D.	Metropolitan Life, New York City.
J. Thornley Bowman, M. D.	London Life, London, Ont.
William M. Bradshaw, M. D.	Mutual Life, New York City.

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Frederick G. Brathwaite, M. D.	Equitable Life, New York City.
Chester T. Brown, M. D.	Prudential, Newark, N. J.
Thomas W. Burrows, M. D.	Central Life, Chicago, Ill.
Joseph T. Cabaniss, M. D.	Travelers, Hartford, Conn.
Frank H. Carber, M. D.	Mutual Life, New York City.
Willard B. Carpenter, M. D.	Columbus Mutual, Columbus, Ohio.
Frederick A. Causey, M. D.	Peoria Life, Peoria, Ill.
Frank W. Chapin, M. D.	Home Life, New York City.
Laurence D. Chapin, M. D.	Massachusetts Mutual, Springfield, Mass.
John P. Chapman, M. D.	Penn Mutual, Philadelphia, Pa.
Charles L. Christiernin, M. D.	Metropolitan Life, New York City.
Charles P. Clark, M. D.	Mutual Benefit, Newark, N. J.
Gates Collier, M. D.	Security Mutual, Binghamton, N. Y.
Henry Colt, M. D.	Berkshire Life, Pittsfield, Mass.
Edwin A. Colton, M. D.	National Life, Montpelier, Vt.
Henry W. Cook, M. D.	Northwestern National, Minneapolis, Minn.
John N. Coolidge, M. D.	Metropolitan Life, New York City.

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Parker M. Cort, M. D.	Aetna Life, Hartford, Conn.
Donald B. Cragin, M. D.	Aetna Life, Hartford, Conn.
Hamilton C. Cruikshank, M. D.	Manufacturers Life, Toronto, Ont.
George Cullen, M. D.	Illinois Life, Chicago, Ill.
Robert M. Daley, M. D.	Equitable Life, New York City.
Joe E. Daniel, M. D.	Great Southern, Houston, Texas.
Ernest J. Dewess, M. D.	Provident Mutual, Philadelphia, Pa.
Edwin G. Dewis, M. D.	Prudential, Newark, N. J.
Wilton E. Dickerman, M. D.	Aetna Life, Hartford, Conn.
Henry K. Dillard, M. D.	Penn Mutual, Philadelphia, Pa.
Edward S. Dillon, M. D.	Penn Mutual, Philadelphia, Pa.
Harold W. Dingman, M. D.	Continental Assurance, Chicago, Ill.
William W. Dinsmore, M. D.	Travelers, Hartford, Conn.
Percy G. Drake, M. D.	Travelers, Hartford, Conn.
Edwin W. Dwight, M. D.	New England Mutual, Boston, Mass.
O. M. Eakins, M. D.	Reliance Life, Pittsburgh, Pa.
Joseph E. Engelson, M. D.	Mutual Life, New York City.

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Calvin H. English, M. D.	Lincoln National, Ft. Wayne, Ind.
William G. Exton, M. D.	Prudential, Newark, N. J.
Haynes H. Fellows, M. D.	Metropolitan Life, New York City.
John Ferguson, M. D.	Excelsior Life, Toronto, Ont.
Ralph M. Filson, M. D.	Travelers, Hartford, Conn.
John W. Fisher, M. D.	Northwestern Mutual, Milwaukee, Wis.
Paul FitzGerald, M. D.	Prudential, Newark, N. J.
Robert A. Fraser, M. D.	New York Life, New York City.
Harold M. Frost, M. D.	New England Mutual, Boston, Mass.
Samuel W. Gadd, M. D.	Philadelphia Life, Philadelphia, Pa.
Homer Gage, M. D.	State Mutual, Worcester, Mass.
Frank I. Ganot, M. D.	Prudential, Newark, N. J.
William S. Gardner, M. D.	Mutual Life, New York City.
Arthur Geiringer, M. D.	Equitable Life, New York City.
Henry W. Gibbons, M. D.	Western States, San Francisco, Calif.
Ralph T. Gilchrist, M. D.	Northwestern Mutual, Milwaukee, Wis.
Alvah H. Gordon, M. D.	London & Scottish, Montreal, Quebec.

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John K. Gordon, M. D.	Sun Life, Montreal, Quebec.
Angus Graham, M. D.	London Life, London, Ont.
LeRoy C. Gran, M. D.	Travelers, Hartford, Conn.
Robert J. Graves, M. D.	United Life & Acci- dent, Concord, N. H.
Arthur H. Griswold, M. D.	Phoenix Mutual, Hart- ford, Conn.
Frank L. Grosvenor, M. D.	Travelers, Hartford, Conn.
Frederick W. Hagney, M. D.	Mutual Benefit, New- ark, N. J.
Joseph B. Hall, M. D.	Connecticut Mutual, Hartford, Conn.
William F. Hamilton, M. D.	Sun Life, Montreal, Quebec.
William J. Hammer, M. D.	New York Life, New York City.
George A. Harlow, M. D.	Northwestern Mutual, Milwaukee, Wis.
Frank Harnden, M. D.	Midland Mutual, Co- lumbus, Ohio.
Calvin L. Harrison, M. D.	New York Life, New York City.
Ernest M. Henderson, M. D.	Confederation Life, Toronto, Ont.
Charles R. Henry, M. D.	State Life, Indianapo- lis, Ind.
William L. Hilliard, M. D.	Ontario Equitable, Waterloo, Ont.
Daniel W. Hoare, M. D.	Penn Mutual, Phila- delphia, Pa.

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John U. Hobach, M. D.	Penn Mutual, Philadelphia, Pa.
Angier B. Hobbs, M. D.	New York Life, New York City.
William W. Hobson, M. D.	Reliance Life, Pittsburgh, Pa.
Eugene M. Holden, M. D.	Metropolitan Life, New York City.
Byam Hollings, M. D.	John Hancock, Boston, Mass.
Jerome F. Honsberger, M. D.	Mutual Life of Canada, Waterloo, Ont.
Joseph C. Horan, M. D.	Metropolitan Life, New York City.
J. Charles Humphreys, M. D.	Penn Mutual, Philadelphia, Pa.
Ross Huston, M. D.	Bankers Life, Des Moines, Iowa.
James P. Hutchinson, M. D.	Penn Mutual, Philadelphia, Pa.
William G. Hutchinson, M. D.	American Life, Detroit, Mich.
Henry S. Hutchison, M. D.	Crown Life, Toronto, Ont.
Lefferts Hutton, M. D.	Mutual Life, New York City.
Washington C. Huyler, M. D.	Mutual Life, New York City.
Phineas H. Ingalls, M. D.	Aetna Life, Hartford, Conn.
Charles B. Irwin, M. D.	North American, Chicago, Ill.
Walter A. Jaquith, M. D.	National Life, Chicago, Ill.

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Benjamin Y. Jaudon, M. D.	Missouri State Life, St. Louis, Mo.
Frank L. B. Jenney, M. D.	Federal Life, Chicago, Ill.
Albert O. Jimenis, M. D.	Metropolitan Life, New York City.
Albert E. Johann, M. D.	Bankers Life, Des Moines, Iowa.
George E. Kanouse, M. D.	Prudential, Newark, N. J.
Morris L. King, M. D.	New York Life, New York City.
Oscar W. King, M. D.	Equitable Life, New York City.
Robert J. Kissock, M. D.	Metropolitan Life, New York City.
Augustus S. Knight, M. D.	Metropolitan Life, New York City.
William P. Lamb, M. D.	Prudential, Newark, N. J.
Anthony J. Lanza, M. D.	Metropolitan Life, New York City.
John L. Larway, M. D.	State Life, Indianapo- lis, Ind.
Ernest H. Lines, M. D.	New York Life, New York City.
John M. Livingston, M. D.	Mutual Life of Canada, Waterloo, Ont.
H. Clive McAlister, M. D.	Lincoln National, Ft. Wayne, Ind.
Milton T. McCarty, M. D.	Peoples Life, Frank- ford, Ind.
Charles N. McCloud, M. D.	Minnesota Mutual, St. Paul, Minn.

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Francis H. McCrudden, M. D.	New England Mutual, Boston, Mass.
Carleton B. McCulloch, M. D.	State Life, Indianapolis, Ind.
Albert A. MacDonald, M. D.	National Life of Canada, Toronto, Ont.
Lewis F. MacKenzie, M. D.	Prudential, Newark, N. J.
Frederick W. McSorley, M. D.	Equitable Life, New York City.
Charles Maertz, M. D.	Union Central, Cincinnati, Ohio.
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Robert W. Mann, M. D.	Imperial Life, Toronto, Ont.
William L. Mann, M. D.	Great West, Winnipeg, Man.
William S. Manners, M. D.	Metropolitan Life, New York City.
Charles F. Martin, M. D.	Standard Life, Montreal, Quebec.
Oscar F. Maxon, M. D.	Franklin Life, Springfield, Ill.
Paul Mazzuri, M. D.	New York Life, New York City.
Samuel W. Means, M. D.	Metropolitan Life, New York City.
John C. Medd, M. D.	Metropolitan Life, New York City.
Archibald Mercer, M. D.	Mutual Benefit, Newark, N. J.
William F. Milroy, M. D.	Bankers Reserve, Omaha, Neb.

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James T. Montgomery, M. D.	Southland Life, Dallas, Texas.
Robert C. Montgomery, M. D.	Manufacturers Life, Toronto, Ont.
William D. Morgan, M. D.	Phoenix Mutual, Hartford, Conn.
William Muhlberg, M. D.	Union Central, Cincinnati, Ohio.
John P. Munn, M. D.	United States Life, New York City.
Charles T. Necker, M. D.	Dominion Life, Waterloo, Ont.
James H. North, M. D.	New York Life, New York City.
Ralph B. Ober, M. D.	Massachusetts Mutual, Springfield, Mass.
Herbert Old, M. D.	Provident Mutual, Philadelphia, Pa.
Martin I. Olsen, M. D.	Central Life, Des Moines, Iowa.
Brace W. Paddock, M. D.	Berkshire Life, Pittsfield, Mass.
Howard A. Pardee, M. D.	United States Life, New York City.
George W. Parker, M. D.	Peoria Life, Peoria, Ill.
J. Allen Patton, M. D.	Prudential, Newark, N. J.
George P. Paul, M. D.	Aetna Life, Hartford, Conn.
William O. Pauli, M. D.	Union Central Life, Cincinnati, Ohio.
John S. Phelps, M. D.	Columbia National, Boston, Mass.
Charles B. Piper, M. D.	Guardian Life, New York City.

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Joseph E. Pollard, M. D.	Prudential, Newark, N. J.
John J. Post, M. D.	Pilot Life, Greensboro, N. C.
Walter A. Reiter, M. D.	Mutual Benefit, Newark, N. J.
Frank P. Righter, M. D.	Atlantic Life, Richmond, Va.
J. A. Roberts, M. D.	Canada Life, Toronto, Ont.
A. J. Robinson, M. D.	Connecticut General, Hartford, Conn.
Thomas H. Rockwell, M. D.	Equitable Life, New York City.
Oscar H. Rogers, M. D.	New York Life, New York City.
Fred W. Rolph, M. D.	Confederation Life, Toronto, Ont.
Henry B. Rollins, M. D.	Connecticut Mutual, Hartford, Conn.
Edward K. Root, M. D.	Aetna Life, Hartford, Conn.
Robert L. Rowley, M. D.	Phoenix Mutual, Hartford, Conn.
Charles L. Rudasill, M. D.	Life Insurance Company of Virginia, Richmond, Va.
Samuel C. Rumford, M. D.	Continental American, Wilmington, Del.
Eugene F. Russell, M. D.	Mutual Life, New York City.
H. Crawford Scadding, M. D.	Canada Life, Toronto, Ont.
C. E. Schilling, M. D.	Ohio State, Columbus, Ohio.

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Samuel B. Scholz, Jr., M. D.	Massachusetts Mutual, Springfield, Mass.
Albert Seaton, M. D.	American Central, In- dianapolis, Ind.
George H. Shaw, M. D.	Travelers, Hartford, Conn.
Joyce T. Sheridan, M. D.	Philadelphia Life, Phil- adelphia, Pa.
Arthur L. Sherrill, M. D.	Equitable Life, New York City.
Daniel M. Shrewbrooks, M. D.	Acacia Mutual, Wash- ington, D. C.
Ross L. Shields, M. D.	Mutual Life, Waterloo, Ont., Canada.
Joseph L. Siner, M. D.	Fidelity Mutual, Phila- delphia, Pa.
Donald W. Skeel, M. D.	Occidental Life, Los Angeles, Calif.
DeWitt Smith, M. D.	Southwestern Life, Dallas, Texas.
James W. Smith, M. D.	American Central, In- dianapolis, Ind.
Malcolm K. Smith, M. D.	Prudential, Newark, N. J.
Thayer A. Smith, M. D.	Mutual Benefit, New- ark, N. J.
Morton Snow, M. D.	Massachusetts Mutual Springfield, Mass.
Marion Souchon, M. D.	Pan-American Life, New Orleans, La.
Howard B. Speer, M. D.	Metropolitan Life, New York City.
Samuel C. Stanton, M. D.	Farmers National, Chi- cago, Ill.

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Henry F. Starr, M. D.	Pilot Life, Greensboro, N. C.
John B. Steele, M. D.	Volunteer State, Chat- tanooga, Tenn.
Hector M. Stevenson, M. D.	Aetna Life, Hartford, Conn.
Archibald R. Stone, M. D.	Missouri State, St. Louis, Mo.
S. J. Streight, M. D.	Canada Life, Toronto, Ont.
Carl Stutsman, M. D.	Merchants Life, Des Moines, Iowa.
Lawrence G. Sykes, M. D.	Connecticut General, Hartford, Conn.
Bion C. Syverson, M. D.	Equitable Life, New York City.
William Thorndike, M. D.	Northwestern Mutual, Milwaukee, Wis.
Walter E. Thornton, M. D.	Lincoln National, Ft. Wayne, Ind.
Paul E. Tiemann, M. D.	New York Life, New York City.
Frank L. Truitt, M. D.	Reserve Loan Life, In- dianapolis, Ind.
John S. Turner, M. D.	Southland Life, Dallas, Texas.
Joseph P. Turner, M. D.	Jefferson Standard, Greensboro, N. C.
Henry G. Tuttle, M. D.	Metropolitan Life, New York City.
Chas. A. Van Dervoort, M. D.	Fidelity Mutual, Phila- delphia, Pa.
Euen Van Kleeck, M. D.	Travelers Insurance, Hartford, Conn.

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Geo. A. Van Wagenen, M. D.	Mutual Benefit, Newark, N. J.
Reynold C. Voss, M. D.	Pan-American, New Orleans, La.
Albert A. Wagner, M. D.	Reliance Life, Pittsburgh, Pa.
Charles E. Waits, M. D.	Southern States, Atlanta, Ga.
John K. Walter, M. D.	Penn Mutual, Philadelphia, Pa.
William R. Ward, M. D.	Mutual Benefit, Newark, N. J.
William E. H. Wehner, M. D.	Fidelity Mutual, Philadelphia, Pa.
Faneuil S. Weisse, M. D.	Mutual Life, New York City.
Fred L. Wells, M. D.	Equitable Life, Des Moines, Iowa.
David E. W. Wenstrand, M. D.	Northwestern Life, Milwaukee, Wis.
Stephen S. Werth, M. D.	Security Life, Chicago, Ill.
Charles D. Wheeler, M. D.	State Mutual, Worcester, Mass.
Chester F. S. Whitney, M. D.	Home Life, New York City.
Alfred A. Willander, M. D.	Mutual Trust, Chicago, Ill.
Thomas H. Willard, M. D.	Metropolitan Life, New York City.
Richard L. Willis, M. D.	Mutual Life, New York City.
Charles H. Willits, M. D.	Provident Mutual, Philadelphia, Pa.

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Edwin B. Wilson, M. D.	Mutual Life, New York City.
Gordon Wilson, M. D.	Maryland Life, Baltimore, Md.
McLeod G. Wilson, M. D.	Travelers, Hartford, Conn.
Harry P. Woley, M. D.	New York Life, New York City.
G. Elliott Woodford, M. D.	Connecticut General, Hartford, Conn.
Wade Wright, M. D.	Metropolitan Life, New York City.
Lauritz S. Ylvisaker, M. D.	Prudential, Newark, N. J.

## HONORARY MEMBERS

John W. Brañnan, M. D.	New York City.
John K. Gore	Newark, N. J.
Robert Henderson	New York City.
Arthur Hunter	New York City.
Thomas Glover Lynn, M. D.	London, England.
Edward E. Rhodes	Newark, N. J.
Archibald A. Welch	Hartford, Conn.
Granville M. White, M. D.	New York City.

## MEMBERS EMERITUS

Henry H. Schroeder, M. D.	Verona, N. J.
Thomas F. McMahon, M. D.	Toronto, Ont.

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COMPANIES AND THEIR REPRESENTATIVES

Acacia Mutual Life Ass'n, Washington, D. C.	D. M. Shewbrooks, M. D.
Aetna Life, Hartford, Conn.	{ P. M. Cort, M. D. D. B. Cragin, M. D. W. E. Dickerman, M. D. P. H. Ingalls, M. D. G. P. Paul, M. D. E. K. Root, M. D. H. M. Stevenson, M. D.
American Central Life, Indianapolis, Ind.	{ Albert Seaton, M. D. J. M. Smith, M. D.
American Life, Detroit, Mich.	W. G. Hutchinson, M. D.
Atlantic Life, Richmond, Va.	F. P. Righter, M. D.
Bankers Life, Des Moines, Iowa.	{ Ross Huston, M. D. A. E. Johann, M. D.
Bankers Reserve Life, Omaha, Neb.	W. F. Milroy, M. D.
Berkshire Life, Pittsfield, Mass.	{ Henry Colt, M. D. B. W. Paddock, M. D.
Canada Life Assurance Co., Toronto, Ont., Can.	{ J. A. Roberts, M. D. H. C. Scadding, M. D. S. J. Streight, M. D.
Central Life Assur. Society, Des Moines, Iowa.	M. I. Olsen, M. D.
Central Life Ins. of Illinois, Chicago, Ill.	T. W. Burrows, M. D.
Columbian National Life, Boston, Mass.	{ F. R. Abbe, M. D. J. S. Phelps, M. D.

## Companies and Representatives 443

Columbus Mutual Life, Columbus, Ohio.	W. B. Carpenter, M. D.
Commonwealth Life, Louisville, Ky.	W. F. Blackford, M. D.
Confederation Life Ass'n, Toronto, Ont., Can.	{ E. M. Henderson, M. D. F. W. Rolph, M. D.
Connecticut General Life, Hartford, Conn.	{ N. J. Barker, M. D. A. J. Robinson, M. D. L. G. Sykes, M. D. G. E. Woodford, M. D.
Connecticut Mutual Life, Hartford, Conn.	{ C. D. Alton, M. D. J. B. Hall, M. D. H. B. Rollins, M. D.
Continental American Life, Wilmington, Del.	S. C. Rumford, M. D.
Continental Assurance Co., Chicago, Ill.	H. W. Dingman, M. D.
Crown Life, Toronto, Ont., Can.	H. S. Hutchison, M. D.
Dominion Life Assurance, Waterloo, Ont., Can.	C. T. Necker, M. D.
Equitable Life Assur. Soc., New York City.	{ E. W. Beckwith, M. D. F. G. Brathwaite, M. D. R. M. Daley, M. D. Arthur Geiringer, M. D. O. W. King, M. D. F. W. McSorley, M. D. H. L. Mann, M. D. T. H. Rockwell, M. D. A. L. Sherrill, M. D. B. C. Syverson, M. D.
Equitable Life of Iowa, Des Moines, Iowa.	F. L. Wells, M. D.

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Excelsior Life, Toronto, Ont., Can.	John Ferguson, M. D.
Farmers National Life, Chicago, Ill.	S. C. Stanton, M. D.
Federal Life, Chicago, Ill.	F. L. B. Jenney, M. D.
Fidelity Mutual Life, Philadelphia, Pa.	{ J. L. Siner, M. D. C. A. Van Dervoort, M. D. W. E. H. Wehner, M. D.
Franklin Life, Springfield, Ill.	O. F. Maxon, M. D.
Great Southern Life, Houston, Texas.	J. E. Daniel, M. D.
Great West Life Assurance, Winnipeg, Man., Can.	W. L. Mann, M. D.
Guardian Life, New York City.	{ M. B. Bender, M. D. C. B. Piper, M. D.
Home Life, New York City.	{ F. W. Chapin, M. D. C. F. S. Whitney, M. D.
Illinois Life, Chicago, Ill.	George Cullen, M. D.
Imperial Assur. Co. of Can., Toronto, Ont., Can.	{ H. B. Anderson, M. D. R. W. Mann, M. D.
Jefferson Standard Life, Greensboro, N. C.	{ J. T. J. Battle, M. D. J. P. Turner, M. D.
John Hancock Mutual Life, Boston, Mass.	{ E. H. Allen, M. D. W. B. Bartlett, M. D. R. A. Behrman, M. D. Byam Hollings, M. D.
Kansas City Life, Kansas City, Mo.	H. A. Baker, M. D.

## Companies and Representatives 445

Life Ins. Co. of Virginia, Richmond, Va.	C. L. Rudasill, M. D.				
Lincoln National Life, Fort Wayne, Ind.	<table><tr><td>C. H. English, M. D.</td></tr><tr><td>H. C. McAlister, M. D.</td></tr><tr><td>W. E. Thornton, M. D.</td></tr></table>	C. H. English, M. D.	H. C. McAlister, M. D.	W. E. Thornton, M. D.	
C. H. English, M. D.					
H. C. McAlister, M. D.					
W. E. Thornton, M. D.					
London & Scottish Assur. Ass'n, Ltd., Montreal, Que., Can.	A. H. Gordon, M. D.				
London Life, London, Ont., Can.	<table><tr><td>J. T. Bowman, M. D.</td></tr><tr><td>Angus Graham, M. D.</td></tr></table>	J. T. Bowman, M. D.	Angus Graham, M. D.		
J. T. Bowman, M. D.					
Angus Graham, M. D.					
Manhattan Life, New York City	G. H. Barber, M. D.				
Manufacturers Life, Toronto, Ont., Can.	<table><tr><td>H. C. Cruikshank, M. D.</td></tr><tr><td>R. C. Montgomery, M. D.</td></tr></table>	H. C. Cruikshank, M. D.	R. C. Montgomery, M. D.		
H. C. Cruikshank, M. D.					
R. C. Montgomery, M. D.					
Maryland Life, Baltimore, Md.	Gordon Wilson, M. D.				
Massachusetts Mutual Life, Springfield, Mass.	<table><tr><td>L. D. Chapin, M. D.</td></tr><tr><td>R. B. Ober, M. D.</td></tr><tr><td>S. B. Scholz, Jr., M. D.</td></tr><tr><td>Morton Snow, M. D.</td></tr></table>	L. D. Chapin, M. D.	R. B. Ober, M. D.	S. B. Scholz, Jr., M. D.	Morton Snow, M. D.
L. D. Chapin, M. D.					
R. B. Ober, M. D.					
S. B. Scholz, Jr., M. D.					
Morton Snow, M. D.					
Merchants Life, Des Moines, Iowa.	Carl Stutsman, M. D.				

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Metropolitan Life,  
New York City.

J. L. Adams, M. D.  
 E. C. Bonnett, M. D.  
 C. L. Christiernin, M. D.  
 J. N. Coolidge, M. D.  
 H. H. Fellows, M. D.  
 E. M. Holden, M. D.  
 J. C. Horan, M. D.  
 A. O. Jimenis, M. D.  
 R. J. Kissock, M. D.  
 A. S. Knight, M. D.  
 A. J. Lanza, M. D.  
 W. S. Manners, M. D.  
 S. W. Means, M. D.  
 J. C. Medd, M. D.  
 H. B. Speer, M. D.  
 H. G. Tuttle, M. D.  
 T. H. Willard, M. D.  
 Wade Wright, M. D.

Midland Mutual Life,  
Columbus, Ohio.

Frank Harnden, M. D.

Minnesota Mutual Life,  
St. Paul, Minn.

C. N. McCloud, M. D.

Missouri State Life,  
St. Louis, Mo.

{ B. Y. Jaudon, M. D.  
 A. R. Stone, M. D.

Mutual Benefit Life,  
Newark, N. J.

C. D. Bennett, M. D.  
 C. P. Clark, M. D.  
 F. W. Hagney, M. D.  
 Archibald Merceer, M. D.  
 W. A. Reiter, M. D.  
 T. A. Smith, M. D.  
 G. A. Van Wagenen, M. D.  
 W. R. Ward, M. D.

Mutual Life Assur. of Can.,  
Waterloo, Ont., Can.

{ J. F. Honsberger, M. D.  
 J. M. Livingston, M. D.  
 R. L. Shields, M. D.

Companies and Representatives 447

Mutual Life of New York, New York City.	{ E. M. Armstrong, M. D. H. A. Bancel, M. D. W. M. Bradshaw, M. D. F. H. Carber, M. D. J. E. Engelson, M. D. W. S. Gardner, M. D. Lefferts Hutton, M. D. W. C. Huyler, M. D. E. F. Russell, M. D. F. S. Weisse, M. D. R. L. Willis, M. D. E. B. Wilson, M. D.
Mutual Trust Life, Chicago, Ill.	A. A. Willander, M. D.
Nat. Life Assur. of Can., Toronto, Ont., Can.	A. A. MacDonald, M. D.
National Life, Montpelier, Vt.	{ G. E. Allen, M. D. A. B. Bisbee, M. D. E. A. Colton, M. D.
Nat. Life of the U. S. A., Chicago, Ill.	W. A. Jaquith, M. D.
New England Mutual Life, Boston, Mass.	{ W. C. Bailey, M. D. D. N. Blakeley, M. D. E. W. Dwight, M. D. H. M. Frost, M. D. F. H. McGrudden, M. D.
New York Life, New York City.	{ T. W. Bickerton, M. D. R. A. Fraser, M. D. W. J. Hammer, M. D. C. L. Harrison, M. D. A. B. Hobbs, M. D. M. L. King, M. D. E. H. Lines, M. D. Paul Mazzuri, M. D. J. H. North, M. D. O. H. Rogers, M. D. P. E. Tieman, M. D. H. P. Woley, M. D.

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North. Amer. Life Assur., Toronto, Ont., Can.	T. D. Archibald, M. D.								
North Amer. Life Ins., Chicago, Ill.	C. B. Irwin, M. D.								
Northwestern Mutual Life, Milwaukee, Wis.	<table><tr><td>J. W. Fisher, M. D.</td></tr><tr><td>R. T. Gilchrist, M. D.</td></tr><tr><td>G. A. Harlow, M. D.</td></tr><tr><td>William Thorndike, M. D.</td></tr><tr><td>D. E. W. Wenstrand, M. D.</td></tr></table>	J. W. Fisher, M. D.	R. T. Gilchrist, M. D.	G. A. Harlow, M. D.	William Thorndike, M. D.	D. E. W. Wenstrand, M. D.			
J. W. Fisher, M. D.									
R. T. Gilchrist, M. D.									
G. A. Harlow, M. D.									
William Thorndike, M. D.									
D. E. W. Wenstrand, M. D.									
Northwestern Nat. Life, Minneapolis, Minn.	H. W. Cook, M. D.								
Occidental Life, Los Angeles, Calif.	D. W. Skell, M. D.								
Ohio State Life, Columbus, Ohio.	C. E. Schilling, M. D.								
Ont. Equit. Life & Acci., Waterloo, Ont., Can.	W. L. Hilliard, M. D.								
Pacific Mutual Life, Los Angeles, Calif.	W. W. Beckett, M. D.								
Pan-American Life, New Orleans, La.	<table><tr><td>Marion Souchon, M. D.</td></tr><tr><td>R. C. Voss, M. D.</td></tr></table>	Marion Souchon, M. D.	R. C. Voss, M. D.						
Marion Souchon, M. D.									
R. C. Voss, M. D.									
Penn Mutual Life, Philadelphia, Pa.	<table><tr><td>J. P. Chapman, M. D.</td></tr><tr><td>H. K. Dillard, M. D.</td></tr><tr><td>E. A. Dillon, M. D.</td></tr><tr><td>D. W. Hoare, M. D.</td></tr><tr><td>J. U. Hobach, M. D.</td></tr><tr><td>J. C. Humphreys, M. D.</td></tr><tr><td>J. P. Hutchinson, M. D.</td></tr><tr><td>J. K. Walker, M. D.</td></tr></table>	J. P. Chapman, M. D.	H. K. Dillard, M. D.	E. A. Dillon, M. D.	D. W. Hoare, M. D.	J. U. Hobach, M. D.	J. C. Humphreys, M. D.	J. P. Hutchinson, M. D.	J. K. Walker, M. D.
J. P. Chapman, M. D.									
H. K. Dillard, M. D.									
E. A. Dillon, M. D.									
D. W. Hoare, M. D.									
J. U. Hobach, M. D.									
J. C. Humphreys, M. D.									
J. P. Hutchinson, M. D.									
J. K. Walker, M. D.									
Peoples Life, Frankfort, Ind.	M. T. McCarty, M. D.								

Companies and Representatives 449

Peoria Life, Peoria, Ill.	{ F. A. Causey, M. D. G. W. Parker, M. D.
Philadelphia Life, Philadelphia, Pa.	{ S. W. Gadd, M. D. J. T. Sheridan, M. D.
Phoenix Mutual Life, Hartford, Conn.	{ A. H. Griswold, M. D. W. D. Morgan, M. D. R. L. Rowley, M. D.
Pilot Life, Greensboro, N. C.	{ J. J. Post, M. D. H. F. Starr, M. D.
Provident Mutual Life, Philadelphia, Pa.	{ E. J. Dewess, M. D. Herbert Old, M. D. C. H. Willits, M. D.
Prudential Ins. Company, Newark, N. J.	{ C. T. Brown, M. D. E. G. Dewis, M. D. W. G. Exton, M. D. Paul FitzGerald, M. D. F. I. Ganot, M. D. G. E. Kanouse, M. D. W. P. Lamb, M. D. L. F. McKenzie, M. D. J. A. Patton, M. D. J. E. Pollard, M. D. M. K. Smith, M. D. L. S. Ylvisaker, M. D.
Reliance Life, Pittsburgh, Pa.	{ O. M. Eakins, M. D. W. W. Hobson, M. D. A. A. Wagner, M. D.
Reserve Loan Life, Indianapolis, Ind.	F. L. Truitt, M. D.
Security Life Ins. Co., Chicago, Ill.	S. S. Werth, M. D.
Security Mutual Life, Binghamton, N. Y.	{ W. B. Aten, M. D. Gates Collier, M. D.

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Southern States Life, Atlanta, Ga.	C. E. Waits, M. D.
Southland Life, Dallas, Texas	{ J. T. Montgomery, M. D. J. S. Turner, M. D.
Southwestern Life, Dallas, Texas	DeWitt Smith, M. D.
Standard Life Assur. Montreal, Que., Can.	C. F. Martin, M. D.
State Life, Indianapolis, Ind.	{ C. R. Henry, M. D. J. L. Larway, M. D. C. B. McCulloch, M. D.
State Mutual Life Assur., Worcester, Mass.	{ E. B. Bigelow, M. D. Homer Gage, M. D. C. D. Wheeler, M. D.
Sun Life Assur. Co. of Canada, Montreal, Que., Can.	{ C. C. Birchard, M. B. J. K. Gordon, M. D. W. F. Hamilton, M. D.
Travelers Ins. Co., Hartford, Conn.	{ J. T. Cabaniss, M. D. W. W. Dinsmore, M. D. P. G. Drake, M. D. R. M. Filson, M. D. L. C. Grau, M. D. F. L. Grosvenor, M. D. G. H. Shaw, M. D. Euen Van Kleeck, M. D. McL. C. Wilson, M. D.
Union Central Life, Cincinnati, Ohio	{ Charles Maertz, M. D. William Muhlberg, M. D. W. O. Pauli, M. D.
Union Mutual Life, Portland, Maine	A. E. Awde, M. D.

**Companies and Representatives 451**

United Life & Accident Insurance Company, Concord, N. H.	R. J. Graves, M. D.
United States Life, New York City	{ J. P. Munn, M. D. { H. A. Pardee, M. D.
Volunteer State Life, Chattanooga, Tenn.	J. B. Steele, M. D.
West Coast Life, San Francisco, Cal.	M. O. Austin, M. D.
Western States Life, San Francisco, Cal.	H. W. Gibbons, M. D.

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**DELEGATES FROM ASSOCIATE MEMBER COMPANIES**

Dr. G. T. Brown, Gem City Life Insurance Company, Dayton, Ohio

Dr. B. F. Byrd, National Life and Accident Insurance Company, Nashville, Tenn.

Dr. E. E. Clovis, Conservative Life Insurance Company, Wheeling, W. Va.

Dr. C. R. Dudley, Continental Life Insurance Company, St. Louis, Mo.

Dr. M. M. Lairy, LaFayette Life Insurance Company, LaFayette, Ind.

Dr. J. B. Neal, Abraham Lincoln Life Insurance Company, Springfield, Ill.

Dr. G. H. Reed, San Jacinto Life Insurance Company, Beaumont, Texas.

## DECEASED MEMBERS

A. W. Barrows, M. D.	Hartford, Conn.
Charles Bernacki, M. D.	New York, N. Y.
Albert W. Billing, M. D.	New York, N. Y.
William R. Bross, M. D.	New York, N. Y.
Chauncey R. Burr, M. D.	New York, N. Y.
Robert L. Burrage, M. D.	Newark, N. J.
James Campbell, M. D.	Hartford, Conn.
Frederick W. Chapin, M. D.	Springfield, Mass.
Ferdinand E. Chatard, M. D.	Baltimore, Md.
Thomas C. Craig, M. D.	New York, N. Y.
Edward Curtis, M. D.	New York, N. Y.
Clark W. Davis, M. D.	Cincinnati, Ohio
William B. Davis, M. D.	Cincinnati, Ohio
Charles A. Devendorf, M. D.	Detroit, Mich.
Frank Donaldson, M. D.	Baltimore, Md.
James B. Eagleson, M. D.	Seattle, Wash.
Z. Taylor Emery, M. D.	New York, N. Y.
Thomas A. Foster, M. D.	Portland, Me.
Thomas H. Gage, M. D.	Worcester, Mass.
Donald M. Gedge, M. D.	New York, N. Y.
Walter R. Gillette, M. D.	New York, N. Y.
Frank S. Grant, M. D.	New York, N. Y.
Landon Carter Gray, M. D.	New York, N. Y.
Ignatius Haines, M. D.	Boston, Mass.
George C. Hall, M. D.	Richmond, Va.
Edward H. Hamill, M. D.	Newark, N. J.
William W. Hitchcock, M. D.	Los Angeles, Cal.
Edgar Holden, M. D.	Newark, N. J.
John Homans, M. D.	Boston, Mass.
John Homans, 2d, M. D.	Boston, Mass.

Abel Huntington, M. D.	New York, N. Y.
Arthur Jukes Johnson, M. D.	Toronto, Ont.
John M. Keating, M. D.	Philadelphia, Pa.
Edward B. Kellogg, M. D.	Boston, Mass.
William W. Knight, M. D.	Hartford, Conn.
Edward Lambert, M. D.	New York, N. Y.
John B. Lewis, M. D.	Hartford, Conn.
John M. Little, M. D.	Boston, Mass.
Robert L. Lounsberry, M. D.	Binghamton, N. Y.
Henry P. Lyster, M. D.	Detroit, Mich.
Lewis McKnight, M. D.	Milwaukee, Wis.
Elias J. Marsh, M. D.	Paterson, N. J.
Henry A. Martelle	Hartford, Conn.
Allison Maxwell, M. D.	Indianapolis, Ind.
Francis D. Merchant, M. D.	New York, N. Y.
William R. Miller, M. D.	Hartford, Conn.
William Natress, M. D.	Toronto, Ont.
Edwin M. Northcott, M. D.	Portland, Me.
Frank K. Paddock, M. D.	Pittsfield, Mass.
William A. Peterson, M. D.	Chicago, Ill.
William E. Porter, M. D.	New York, N. Y.
Albert T. Post, M. D.	New York, N. Y.
James T. Priestly, M. D.	Des Moines, Iowa
Oliver P. Rex, M. D.	Philadelphia, Pa.
James F. W. Ross, M. D.	Toronto, Ont.
Gurdon W. Russell, M. D.	Hartford, Conn.
George R. Shepard, M. D.	Hartford, Conn.
George S. Stebbins, M. D.	Springfield, Mass.
George S. Strathy, M. D.	Toronto, Ont.
Melancthon Storrs, M. D.	Hartford, Conn.
Brandreth Symonds, M. D.	New York, N. Y.
H. Cabell Tabb, M. D.	Richmond, Va.

James Thorburn, M. D.	Toronto, Ont.
James D. Thorburn, M. D.	Toronto, Ont.
Harry Toulmin, M. D.	Philadelphia, Pa.
Henry Tuck, M. D.	New York, N. Y.
S. Oakley Van der Poel, M. D.	New York, N. Y.
A. L. Vanderwater, M. D.	New York, N. Y.
Clinton D. W. VanDyck, M. D.	New York, N. Y.
Aaron C. Ward, M. D.	Newark, N. J.
Wm. Perry Watson, M. D.	Newark, N. J.
Joseph H. Webb, M. D.	Waterloo, Ont.
Ernest A. Wells, M. D.	Hartford, Conn.
Frank Wells, M. D.	Boston, Mass.
Franklin C. Wells, M. D.	New York, N. Y.
George W. Wells, M. D.	New York, N. Y.
A. H. Whitridge, M. D.	Baltimore, Md.
George Wilkins, M. D.	Montreal, Que.
G. S. Winston, M. D.	New York, N. Y.
Albert Wood, M. D.	Worcester, Mass.
Green V. Woolen, M. D.	Indianapolis, Ind.
John C. Young, M. D.	Detroit, Mich.
Joseph C. Young, M. D.	Newark, N. J.